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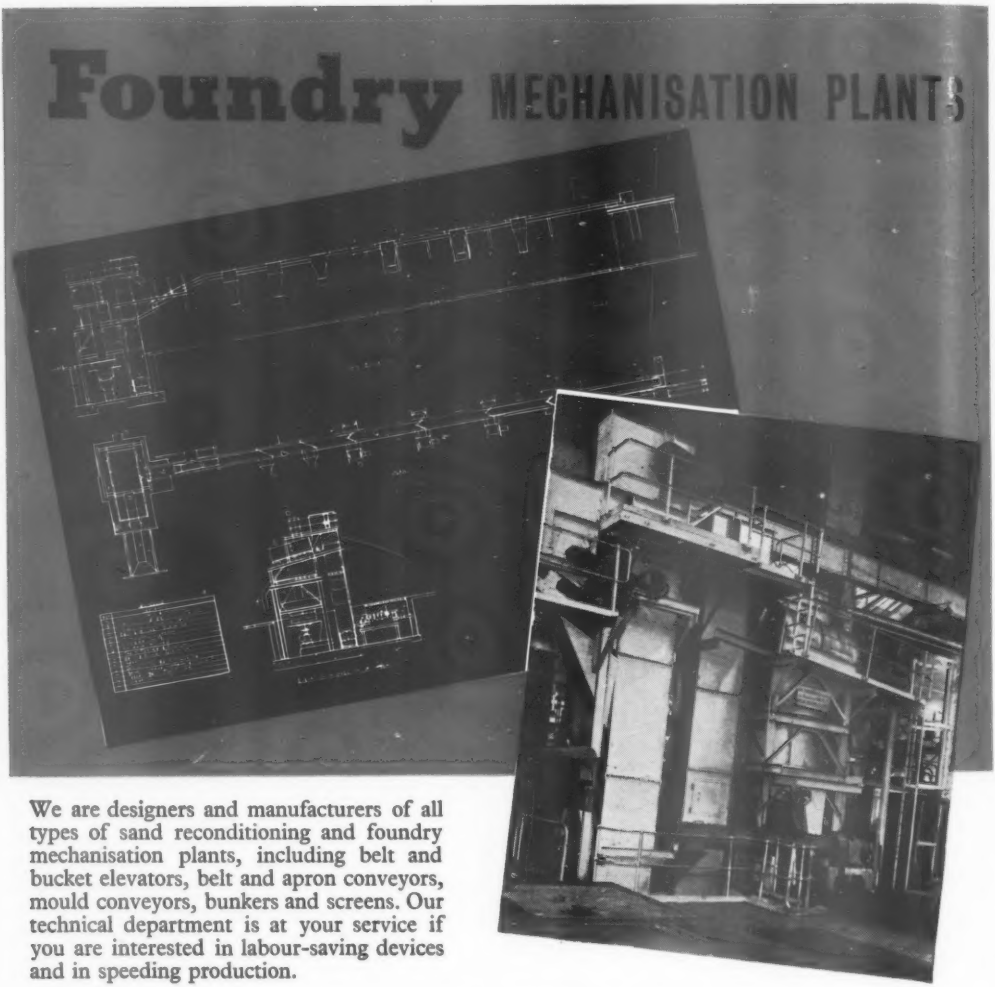

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V. C. FAULKNER, F.R.S.A., HON.M.I.B.F.

Assistant Editor: A. R. PARKES, M.I.B.F.
Commercial Editor: P. E. CARDEN.

Advertising Manager:
F. BARRINGTON HOOPER, B.A.

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Publisher: H. J. DWYER
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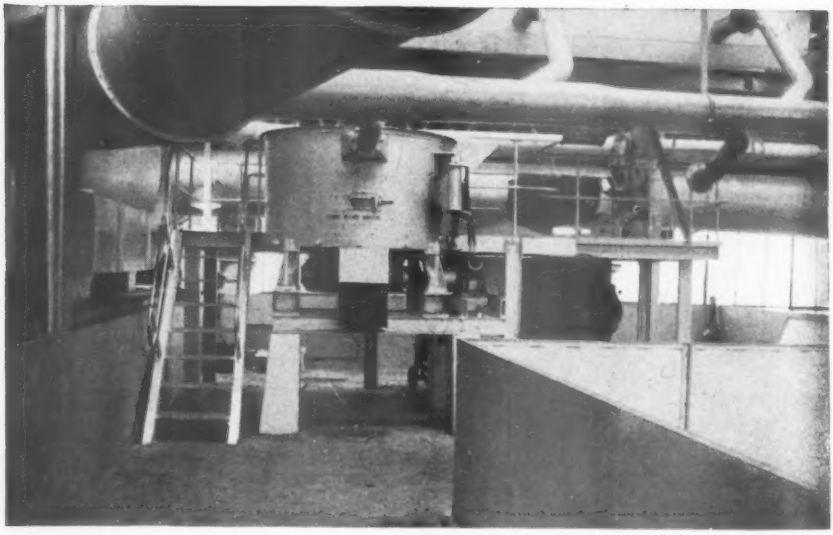
MODERN FOUNDRY PLANNING



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Photograph by courtesy of The International Harvester Co. of Great Britain Ltd., Doncaster.

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FOUNDRY
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Causes of Bankruptcy

Speaking as president of the *Syndicat Général des Fondeurs de France* (the French employers' association, at their 60th annual banquet, Mr. Olivier presented to his audience a summary—of American origin—showing why, in 1956, various firms in industry and wholesale and retail trades had gone out of business. In the summary, the reasons were classified under four main headings:—" negligence," " crime," " inexperience " and " bad luck." The first category in industry accounted for 3.1 per cent. It was sub-divided into " bad habits," " ill health," " marital difficulties " and " diverse," but the only one of importance to us here is ill health, which accounted for 2.1 per cent. " Crime," which accounted for 2 per cent. of the bankruptcies, carried the subhead " by falsified balance sheets " (1.4 per cent.). The fourth major principal cause, " bad luck " (1.8 per cent.), was sub-divided into " fire," " flood," " theft," " misdeeds by staff," " strikes " and " diverse," and here the list was headed by fire, which put 1.1 per cent. of the firms out of business.

It is number three in the original classification—inexperience—which is of major importance to industry as it accounted for 92.7 of the bankruptcies. The sub-divisions are illuminating. The least numerous (0.5 per cent.) came under the heading of " poor location "; then, at 7.2 per cent., comes " over-stocking." This factor is of outstanding importance in this country at the present time, owing to the high rate of interest one has to pay for the financing of stocks. " Excessive overheads " at 8.8 per cent. is another point worth watching by executives, as it is beginning to loom large in the summary, and at 9.1 per cent., is only slightly less important than " over capitalization." The next two headings " poor credit " (11.8 per cent.) and " weak competitive power " (14.9 per cent.) would appear to us to be more in the nature of excuses than reasons, as they must be due to some more basic factor. However, as the main heading was " inexperience," they will pass muster, but we would have preferred the figures quoted there to swell the other headings.

The largest factor entering into this " inexperience " heading and indeed for the complete table was " badly established cost prices." It was responsible for no fewer than 54.5 per cent. of the bankruptcies in the United States in 1956. Obviously, it presents a good case for the introduction of a proper system of works cost accounting, yet this is not the whole story. Executives of small and medium-size foundries are well able to estimate their costs of production by intuition, guesswork—call it what you will—(in fact, their balance sheets and personal incomes amply demonstrate this), but are they sure that such insight is sufficient to carry them through a period when cut-throat competition is rife? At such times, it is too late to seek expensive advice as this would send up " excessive overheads," the 8.8 per cent. factor. The principal lesson to be derived from the American summary is that strength in the domain of costing is the most potent factor in keeping a firm permanently sound and it is worth devoting much time, study and money to the acquisition of basic cost information for the activities undertaken.

Technical Training College Expansion

The number of places available for students who wish to train to become technical teachers is to be increased by over 60 per cent., and substantially higher rates of grant are to be paid to students. Full details of the new scales of grant to students will not be known before the completion of the triennial review of the standard figures of maintenance for students at universities, and of training college grants, which is now in progress, but the final settlement will include increased personal grants to students, together with travelling expenses. Dependants' grants will also be increased, and married students, or students with dependants who have to maintain separate homes will receive a special grant. In addition to these grants, which are provided by the students' home authorities, students will normally receive free tuition and their own board and lodging. Account will be taken of other income in assessing a student's grant.

Increased grants for these particular students are considered necessary because the technical training colleges need to recruit almost entirely people from settled occupations in industry and commerce. The principle accepted by the Ministry of Education and the local authority associations will be that a married student with one or more children and a separate home to maintain, who is receiving grant while attending a course of pre-service training, should be no worse off financially than if he were in fact earning the basic minimum salary of a grade A assistant in a technical college (at present £475).

It is expected that the technical colleges will have to recruit over 2,000 new full-time teachers a year to make good losses and provide for expansion. The arrangements made by the Ministry are designed to increase the number and improve the quality of those who enter the profession through the technical training colleges. Much larger numbers are recruited direct from industry. It is proposed also to establish courses of full-time training for technical teachers already in service. The Minister will soon be discussing with the associations concerned the financial assistance to be given to teachers seconded to such courses.

All these new developments are the result of recommendations made by a special committee on the Supply and Training of Teachers for Technical Colleges which was set up by the Minister of Education in 1956. A new standing committee has been set up, under the chairmanship of Dr. Willis Jackson, F.R.S., director of research and education, Metropolitan Vickers Company, Limited (who was also chairman of the special committee) to keep under permanent review matters concerned with the supply and training of teachers for establishment of further education. It is one of the standing committees of the Minister's National Advisory Council on the Training and Supply of Teachers, and includes representatives of local authorities, technical colleges, technical training colleges, university institutes of education, and industry and commerce.

Worshipful Company of Founders

The annual tour of foundries by members of the Livery of the Worshipful Company of Founders will take place from Wednesday, May 7, until Friday, May 9. The works to be visited include W. & T. Avery's new Tame Bridge foundry, the foundry at Burton-on-Trent of Lloyds (Burton) Limited, the Phoenix foundry of Chamberlin & Hill, Limited, at Lichfield, and the Brownhills malleable foundry of Castings, Limited.

British Exhibit at Cleveland

Subsequent to the announcement in the January 30 issue of the JOURNAL, page 131, that Foundry Equipment, Limited, Linslade Works, Leighton Buzzard, Bedfordshire, are taking one of the largest stands at the Cleveland Foundry Show, the following information about the equipment to be demonstrated has now been released. In its basic conception, the stand (which will occupy nearly 2,500 sq. ft.) is intended to represent a complete foundry in operation (excluding melting facilities) and for this purpose the company is sending to America (among other items) the following plant: A pair of deep-jolt/squeeze/strip machines; an Hydroil electric high-pressure undersand frame moulding machine with automatic operation; a flaskless mould machine; a Sandrammer (slinger type); an automatic coreblower and rollover stripper; a two-station automatic shell-moulding machine; electro-vibratory shakeout; and a pneumatic pusher. There will be a powered continuous-platform type of mould conveyor; a Con-Belt sand muller (for up to 500 tons per hour); electronic hopper-level indicators and automatic ploughs. All is to be integrated, with conveyor, elevator and distribution systems. The majority is new and designed specially for the American market with "electrics" to JIC or CSA approval and with US threads. Stockists are being appointed to permit "off shelf" deliveries throughout the US.

To ensure that the equipment will operate with the maximum efficiency at Cleveland, the company proposes to erect a "dummy" stand at the Leighton Buzzard works, and has decided to stage an "open week" from March 11 to 14.

International Foundry Congress

The 25th International Foundry Congress is to be held in Belgium, where this year's International Trade Fair is also being staged. The Congress is to be officially opened on Monday, September 9, in the Palais des Congres, located within the Brussels exhibition. During the evening, the participants travel to Liège where next day, Tuesday, the technical sessions will begin in another Palais des Congres. Wednesday will be devoted to meetings of the various International Committees and to works visits. On Thursday, there are to be more technical sessions and the closing banquet. On Friday and Saturday, October 3 and 4, there are to be further works visits in Belgium and Luxembourg. A special programme is to be organized for the entertainment of the ladies.

National Society of Master Patternmakers

Arrangements have been made for members of the National Society of Master Patternmakers to visit the textile mill of Richard Haworth, Limited, Salford, Manchester, on February 19. The mill is regarded as one of the most up-to-date vertical mills in Lancashire, and visitors will be shown the full process of cloth making from the receipt of a bale of raw cotton, through the various operations, to the final stage of inspection of the woven cloth before despatch. Having regard to the nature of the product, ladies should be particularly interested and are cordially invited to participate. The visit will be preceded by luncheon at the Grand Hotel, Manchester, at 12.30 for 12.45 p.m.; those not wishing to partake of the luncheon should be at the Grand Hotel at 2 p.m.

Swelling of Wood Patterns*

By Lars Lange

One day, the Author relates, the superintendent of the engineering shop of a works paid a visit to the patternmakers and complained of how carelessly they had made the pattern for a belt guard. The casting for the casing was so much oversize that if the overall dimensions were to be kept there would be no room for the attachment nuts on the lugs and hence the casting had to be scrapped. However, it could be ascertained that the patterns had been dimensionally checked before leaving the patternshop and a new check-up showed that the pattern dimensions were still correct. Also, since the core and core-print cavities matched and the section thicknesses were correct the moulder could not be blamed either. But there was no gainsaying the fact that the casting was oversize. This unexpected inaccuracy was an instance of a problem which is of concern to all founders and in what follows the causatory features are outlined.

The solution of cases where a casting is produced which is larger than its pattern (as in the example mentioned in the introductory paragraph) often becomes apparent on investigating when the pattern was made and when it was first used in the foundry. In the particular instance cited the pattern had been made in the beginning of December and then sent to the pattern store. There it lay on a shelf for two months before being taken into the foundry. This store which was unheated was partitioned off by a thin wooden boarding through which the damp wintry atmosphere could penetrate and come into contact with the patterns. What had happened was that the pattern and core-box had absorbed moisture and had swollen, increasing the width (see Fig. 1). Since both had swollen by the same amount the error was not observed in the foundry. A check-up before moulding would have revealed the defect. But how many foundries carry out such check-ups on new patterns?

Careless Pattern Storage

Unfortunately such occurrences are fairly common and unsuitable pattern storage may lead to very costly rejects. Besides, the real source of the trouble is seldom correctly diagnosed. The defect is ascribed to faulty casting practice or patterns and is left at that. A study of the interconnection between the life and dimensional stability of the pattern on the one hand and humidity conditions obtaining in its immediate vicinity on the other would be well worth while.

Wood, a Living Material

Wood is made up of tubuliform cellulose fibres cemented together by the glue-substance, lignin. These fibres form a system of tubules in the tree body and hold a large amount of water. When felled, the trunk contains around 50 per cent. of water. Of this quantity, 70 per cent. is loosely retained by the cellulose fibres. The remainder of the water is more or less firmly bonded to the fibres. Thus, a freshly-sawn plank may lose up to about 70 per cent. of the water without changing its volume. On further drying the fibres begin to lose their bonded water and start to shrink. Complete drying does not result unless the ambient atmosphere is warm and very dry. A relatively long time is also required. Should the air become humid the superficial fibres will re-absorb water and this will result in a volume increase. Swelling and shrinkage of the plank is altogether dependent on the humidity of the air. Hence, during swelling, the volume increase is greater in the outer layers of the pattern than in the underlying parts. Wood which is subjected to air of varying humidity is susceptible to dimensional changes.

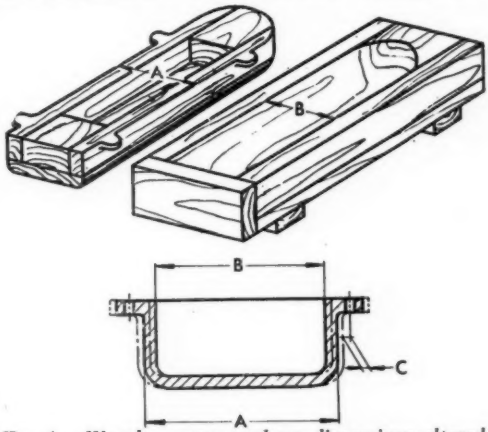

FIG. 1.—*Wooden pattern whose dimensions altered during storage. Dimensions A and B increased, resulting in a decrease in C, which became too small and led to casting rejects.*

Magnitude of Shrinkage

Swelling and shrinkage vary with different types of wood, from sample to sample of the same wood and with different directions in the same sample. The greatest dimensional variation takes place in a direction parallel to the annual rings, *i.e.* the tangential shrinkage. The radial shrinkage, *i.e.* from core to surface, is only half as large. The smallest shrinkage takes place longitudinally and is about one-tenth of the radial shrinkage (see

* Abstracted from *Gjuteriet* 47 (1957) :11, p. 189-192.

Swelling of Wood Patterns

Fig. 2). In recording the amount of moisture in a wood sample the current practice is to state the percentage of moisture reckoned on the dry weight of the sample. This is called the moisture quotient.† Below the moisture-saturation value of the wood fibre there exists a practically straight-line relation-

TABLE I.—*Mean Shrinkage Value for Types of Fir and Beech.*

Shrinkage, per cent.	Fir.		Beech.	
	(1)	(2)	(1)	(2)
Longitudinal	0.33	0.4	0.21	0.3
Radial	3.4	3.4	5.5	5.8
Tangential	6.9	7.7	11.3	11.8

ship between the moisture quotient and the amount of swelling or shrinkage (see Fig. 3). Assuming that the moisture quotient μ of saturated wood fibre is 30 per cent., there occurs on drying to $\mu = 15$ per cent. a shrinkage in the wood equivalent to about half of the total shrinkage occurring on complete drying. In this way shrinkage can be calculated

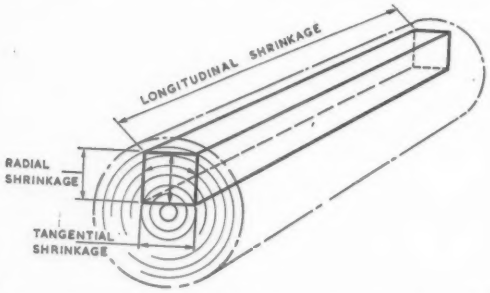

FIG. 2.—*Shrinkage directions in wood—radial shrinkage, tangential shrinkage and longitudinal shrinkage.*

for the various values of μ. The following table gives some mean shrinkage values for various types of fir and beech.

Illustrations of Effect of Shrinkage

Assuming that the tangential shrinkage of a given type of wood is 7 per cent. and the moisture ratio at fibre saturation is 30 per cent. the wood will swell or shrink $\frac{7}{30}$ part per hundred for every unit change in the moisture quotient. For example, in a foundry the atmospheric humidity corresponds to a moisture quotient of 6 per cent. in the wood. A pattern is made from air-dried wood whose moisture quotient is around 12 per cent. In the foundry the pattern is found to be dimensionally accurate and a satisfactory casting is made from it. The pattern is now stored in premises where the equilibrium moisture quotient of wood is 6 per cent. Some months later a new casting is made from it and this time the casting is undersized. The reason is that the wood has now changed its moisture quotient from 12 to 6 per cent., which results in a shrinkage of about $\frac{6 \times 7}{30}$ per cent., *i.e.* about 1.4 per cent. in the tangential direction. Hence it is

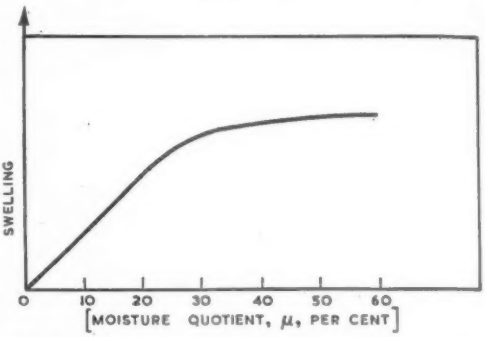

FIG. 3.—*The swelling of wood for different moisture contents.*

established that wood articles that have to remain dimensionally constant must always be stored in an atmosphere of constant humidity.

Atmospheric Humidity in Foundry Shops

As wood absorbs moisture from the ambient atmosphere a survey of the humidity in some Swedish foundries where patterns were kept was undertaken in order to gain some idea of normal values that might be encountered. The survey covered different seasons in the year. For the purposes of this survey one may regard the foundries as belonging to two groups, *viz.*, one in which patterns are kept in well-heated premises and the other in which they are kept sometimes in heated and sometimes in unheated premises.

The findings (Table II) for the moisture quotient of the wood patterns can be summarized as follows:

For patterns kept in permanently-heated premises the moisture quotient was low the whole year round, lying generally between 4.5 and 6 per cent. Patterns kept under varying conditions showed, as expected, a large range of moisture ratios, being drier in summer and more moist in winter, the extremes ranging from 2.3 per cent. (heated brick premises) to 18.5 per cent. (unheated sheds of corrugated sheet). The mean value for all heated premises, *i.e.* patternshop, pattern store and foundry, including moulding sites and pattern shelves, was 6.55 per cent. and for all unheated premises it was 12.1 per cent.

The moisture quotients showed least variation in the patternshops and at the moulding sites whereas they were greatest at the pattern shelves; those situated near furnaces had smaller moisture quotients than those near transport lanes. The moisture quotients are high in all unheated premises, whether of brick, wood, or corrugated sheet. It is generally assumed that store sheds of the latter material are dampest. That similar moisture

† The Swedish term moisture-quotient has been retained although in this country it is more usual to express moisture contents (losses on drying) as percentages of the original.

quotients were found in brick and in wood premises may be due to the fact that once dampness has found its way into such buildings it stays there for a considerably longer time than in sheds, from which dampness is easily removed by airing in suitable weather.

The results from pattern stores were inconclusive. Insufficient data were available concerning the individual layout and siting of the premises to enable a general idea to be formed and defined of the variations in the moisture quotient of patterns stored there. The conditions obtaining in heated premises are not always ideal for patterns. The atmosphere there may be too dry and hence patterns may shrink on being taken from the pattern-shop. However, the other extreme of unheated storage is much more unfavourable for patterns.

Glued Joints and Varnishes

With regard to the temperatures in unheated stores it was found that although the current trend is to use "waterproof" glues there was no glue capable of withstanding the twofold stresses arising from the swelling of the wood and the bursting power of freezing water. As regard paint coats these were, it was discovered, seldom so elastic that they were able to conform to the dimensional changes of the underlying material. Hence the coats cracked and moisture could penetrate into the wood.

The foregoing details all point to the fact that anything spent on pattern care is more than compensated for by increased production and better finish. It must be remembered that the greatest cost in this connection is not the actual pattern maintenance but the cost of scrapped castings. There are, too, other expenses which follow in the wake of pattern neglect. A machining allowance of $\frac{1}{8}$ in. may be sufficient for a casting but owing to the undependability of pattern, dimensional accuracy allowances up to $\frac{5}{16}$ in. have to be tolerated. How are series-production runs to be planned if tolerances cannot be kept? Of course, it is always possible to change over to metal patterns but this would imply a completely unnecessary depreciation of wood which is a much cheaper material and is, for many purposes, perfectly satisfactory.

TABLE II.—*Pattern-moisture Quotients for Five Foundries During January and June.**

Month.	Patternshop.	Foundry.		Pattern store.				
		Moulding sites.	Pattern shelves.	Heated brick building.	Heated wooden building.	Unheated brick building.	Unheated wooden building.	Unheated corrugated-sheet shed.
January ..	4.8–6.5 Av. 5.4	4.0–11.0 6.7	2.9–12.6 6.4	2.3–9.3 5.7	3.9–9.7 6.8	9.3–18.5 13.9	9.6–17.3 13.4	15.2–18.5 17.3
		6.16		6.25			14.86	
June ..	4.9–7.7 Av. 6.0	5.5–8.0 6.8	4.3–10.5 7.4	3.8–8.0 6.2	7.0–10.0 8.5	8.3–10.5 9.4	7.1–11.0 10.9	6.0–9.5 7.6
		6.76		7.35			9.3	
		6.3		6.8			12.1	
Whole year			6.55				12.1	
				9.3				

* Moisture quotient expressed in per cent. The upper spaces contain lowest and highest values, below them the mean.

Leeds University Development Scheme

Progress report on a comprehensive scheme for developing Leeds University reveals that the Houldsworth School of Applied Science, which will cost £620,000, will be completed in June. It has been named after the late Sir Hubert Houldsworth, a former chairman of the National Coal Board and Pro-Chancellor of the university. The school is designed to house three departments—gas engineering and general fuel science, with ceramics; chemical engineering, and metallurgy.

The scheme, which will cost over £6,000,000, also includes three new engineering buildings to cost £1,500,000, a chemistry and physics extension to cost £520,000, a new arts building (£720,000), and the Weetwood residential centre (£900,000). The university has begun the first stage of a large building which will house the three engineering departments. The last stage will begin in 1961.

Newton, Chambers—Ransomes & Rapier Merger Agreement

Shareholders of Newton, Chambers & Company, Limited, Thorncliffe, near Sheffield, and Ransomes & Rapier, Limited, Ipswich, are being recommended by their respective boards to agree to a merger of the interests of the two companies by means of an exchange of four Newton Chambers £1 shares for nine Ransomes & Rapier 10s. ordinary shares.

Under the terms of the proposed merger each company will preserve its full identity.

Newton, Chambers & Company, ironfounders, structural engineers, makers of plant for gasworks, steelworks, blast furnaces, etc., has a one-class issued capital of £2,000,000, while Ransomes & Rapier, engineers, ironfounders, makers of cranes, railway plant, etc., has an issued capital of £814,000, including £684,000 in ordinary shares.

Equipment & Supplies

Sand for Shell-moulding

Dowsett Mineral Recovery, Limited, Wansford, Peterborough, whose primary purpose is open-cast iron-ore mining, have recently been developing fine silica sand encountered on their property, and now offer it to foundries, particularly for shell-moulding purposes. The quarry is situated near Wansford, two miles to the west of the Great North Road and some six miles or so south of Stamford. Geologically the sand occurs as part of the lower estuarine series, situated above the Northamptonshire ironstone and separated from it by a few feet of blue clay. The sand is white in appearance and it has been independently reported that the sand has a grain-fineness classification of AFA. No. 112 and, as such, is suitably graded to make shells of reasonable strength combined with accuracy of definition. It is not contaminated with organic materials and is sufficiently low in clay content to enable good dispersion of the resin to be obtained. Its refractory qualities are high and the grains are mainly sub-angular. The percentage composition of the sand may be taken as follows:—SiO_2 98.5; Al_2O_3 0.53; Fe_2O_3 0.12; K_2O and Na_2O together 0.70 per cent, and the loss on ignition 0.14. An average sieve grading analysis for the sand shows that retained on BS sieve: No. 85 is only a trace; on No. 100, 10 to 20; No. 150, 50 to 60; No. 200 20 to 30, and passing No. 200, 5 to 10 per cent. After excavation, the sand is transported to a washing and processing plant where the vast majority of the small amount of clay is removed. The residual washed sand is then heat-dried and packed in 1-cwt. multi-ply paper sacks for despatch by road. (Alternatively, bulk supplies of moist sand are available). Ample amounts, it is contended, are available to cover any demands which could be made in the foreseeable future.

All-purpose Pump

A new pump, which is in fact an adaptation of the Archimedean lift pump, has been announced by Goodyear Pumps, Limited, of Camborne, Cornwall, a subsidiary of Holman Bros., Limited. In the design the "screw" of the Archimedes pump has been borrowed but the principle has been revolutionized by the addition of one extra part. Three sizes of the pump (1¼ in., 1½ in., and 2½ in. suction and delivery connections) requiring prime movers of from ¼ to 16 b.h.p. cover a range of outputs from 4½ to 167 gallons per minute, against heads of from 50 to 200 ft. The 1½-in. pump, weighing a mere 11 lb. and of size 8 by 4 by 9 in., can deliver (at 3,000 r.p.m.) 31 gal. per minute against a 200-ft. head and requires a prime mover of 3.1 b.h.p. only.

The simplicity of the pump and its wide speed range of from 750 to 3,000 r.p.m. (it can also run when required at 6,000 r.p.m.), and its lightness are among the advantages claimed for it. Delivery pressures up to 85 lb. per sq. in. or 200-ft. head per stage may be employed (higher in approved cases) and suctions of 27½ in. of mercury are possible. It can be supplied with the pump casing and rotor manufactured in materials best suited to the particular type of application—light alloy for portable units, Meehanite for process pumping and bronze for marine work.

Hand Stacker Truck

To meet the need of the small user Lansing Bagnall, Limited, of Basingstoke, Hampshire, have developed a hand stacker which, while able to operate in very confined spaces, is capable of lifting loads of 1,120 lb. at 15-in. load centres. Based fundamentally on the "straddle principle," the lifting mechanism is of the electro-hydraulic type, power being supplied by a 12-V. battery. Lifting speed is approximately 10 ft. per min., and push-button controls operate a solenoid controlling an electric motor which is coupled to a piston-type high-pressure hydraulic pump. Lift heights of up to 84 inches can be provided, and the whole unit can operate in gangways less than 6 ft. wide. The stacker incorporates a built-in charger, and recharging is effected by plugging the lead from the truck direct into the main supply.

FIG. 1.—*Hand stacker for use in confined spaces.*

NEWTON CHAMBERS & COMPANY, LIMITED, of Thorncliffe, near Sheffield, have introduced truck-mounted models of their NCK 304 and NCK 205 cranes. The former has a lifting capacity of 15 tons at 10-ft. radius and booms up to 80 ft. can be used. It can be converted from crane work to excavator work. The NCK 205 is a smaller machine for use in work which does not require the larger model.

INDUSTRIAL DRIVES, LIMITED, of Ealing, London, have introduced a new machine, the Druce-Elliot variable-speed unit, which has a cam designed to take fuller advantage of the usual method of transmitting power with a vee belt from a standard electric motor in order to obtain a range of speed ratios between the driving and the driven member. Actuated by a handwheel in the motor-support base, a screw moves the motor in its guides towards or away from the driven unit, taking the pulley assemble with it. The outer, or sliding, flange of the pulley moves at a divergent angle to the motor slide, causing it to open or close according to the direction of rotation of the handwheel. The combination of these movements maintains the tension and alignment of the belt, irrespective of the speed ratio selected. The unit is manufactured in sizes to accommodate motors from ½ h.p. up to 15 h.p.

Survey of Abrasion-resistance Tests for Vitreous Enamels*

By J. A. Clarke

In this paper the Author discusses a number of methods which he has investigated in the search for a standard abrasive- or scratch-resistance test for vitreous enamels. He finds that the defining of an absolute standard still presents formidable difficulties, and that existing methods all have various drawbacks. The article concludes with a report of the discussion which followed the original presentation of the paper.

Any attempt to produce a suitable standard abrasion- or scratch-resistance test for vitreous enamel must commence with the question—what is required, a test for abrasion-resistance or for scratch-resistance? By the latter, one would think of a purely surface condition in which the glaze only is destroyed whereas, with the former, the loss of a considerable amount of enamel below the surface is envisaged. In many normal domestic usages, as for example drawing saucepans over a cooker hob, using a knife on a table top, sliding crockery on a draining board, the emphasis would definitely appear to be on scratch-resistance since sharp points are involved in all the cases cited and these points would cause scratching of the surface, as opposed to sustained abrasion of the sub-surface layers. Furthermore, once the surface is scratched, the appearance of any article is seriously impaired and what happens subsequently is of little account except in certain very specialized cases.

These considerations lead to the view that the aim should be to measure the resistance of the surface to scratching, rather than the resistance of the enamel layer to abrasion. A further point in favour of this hypothesis is that, generally speaking, the apparatus required to assess scratch-resistance would be likely to be less complicated and costly than that required for assessing abrasion-resistance.

It will be appropriate at this point to give a summary of the results of an investigation which were carried out by the Author some time ago, together with a survey of the methods used and results obtained by other workers in the same field—using both scratch and abrasion techniques.

The first test which will come to mind is, of course, the one using mineral powders arranged according to Mohs' Scale and listed in B.S.1344. This was rejected as being quite unsuitable mainly due to the fact that it is not sufficiently selective. Most enamels are passed by one powder and failed by the next—virtually, no graduation of enamels is possible by this method.

Before breaking a lot of new ground, it was considered advisable to investigate the methods used by the paint industry to see whether any of their tests could be adapted to vitreous enamel. There appeared appeared to be three tests in general use[1]. The first of these was an apparatus in which a fixed metal needle makes a scratch, the test-plate being drawn along underneath. The point of the needle is a spherical steel ball, usually 1 mm. in diameter, and the needle can be suitably loaded. Failure occurs when the ball completely penetrates the layer. When an attempt was made to test enamel with this instrument, the needle merely slid over the surface when any normal load was applied and the apparatus was found, for this and other reasons, to be quite unsuitable for use in the enamelling industry.

Sward Rocker

The second was the Sward Rocker, or one of its variations. In this type of apparatus, the number of oscillations of a circular rocker are counted between given amplitudes, the figure obtained being a measure of the hardness of the surface. Since plate-glass is used as a standard surface to calibrate this instrument, it is at once obvious that little differentation could be expected with vitreous enamels. Other factors also preclude its use as a test in the enamel industry.

Taber Abraser

The third was the Taber Abraser. This consists essentially of two abrasive wheels capable of rotation which are pressed against the surface to be tested. The sample is clamped to a turntable which is then rotated. This causes the wheels to rub against the specimen and the loss in weight obtained after a specified number of revolutions is a measure of the abrasion-resistance. Work was not carried out with this apparatus as it was considered to be unsuitable for testing enamel but, recently, Ashby and Niklewski presented a paper to the Institute of Vitreous Enamellers[2] describing an invitation carried out with the Taber Abraser. It would appear from the discussion following the presentation of this paper that, whilst the Taber Abraser is a valuable research instrument, it is not entirely suitable for use as a standard test.

In an endeavour to try to simulate service conditions, the Author developed a fairly simple abrasion machine. This consisted basically of a metal "rubber" of known area and weight, giving an initial minimum load of 20 gm. per sq. cm. It could be further loaded to a maximum of 250 gm. per sq. cm. Selvyt cloth; or any other suitable material, could be attached to the "rubber," the cloth then being impregnated with any desired abrasive. The "rubber" was driven back and forth by an eccentric drive from a constant speed

* Paper presented at the annual conference of the Institute of Vitreous Enamellers.

motor so that there was no variation in speed with increasing load. The speed was approximately one complete back-and-forward stroke per second. The length, and hence the speed, of the stroke could be varied. The plate was clamped in a position underneath the " rubber " during testing.

A large number of experiments were carried out, using many different abrasives (*e.g.*, Selvyt cloth impregnated with silica, aluminium oxide, carborundum, etc.) in many different grades of fineness. Various types and grades of emery cloth were also employed. In all cases, tests were carried out both wet and dry. All the above materials were used with different loads and for varying periods but the results obtained were in no way suitable for a standard test. Generally speaking, if one enamel was attacked, all other enamels tried were also attacked under the same conditions and, in some cases, contrary to service experience. A big difficulty was assessment of results—visual inspection seemed the only solution. It was at one stage hoped that a " go or no-go " type of criterion might be adopted but this, too, proved untenable. For these reasons, the test was discarded. As this appeared to be further evidence against the use of abrasion testing, work was then directed towards the evaluation of methods, using diamond points for the estimation of scratch-resistance.

Scratch-resistance

The apparatus used for much of this work was as follows:—

Two parts were involved, the first part consisting of a brass block, cut out on the underside to form two parallel runners, enabling it to slide smoothly over the surface to be tested. It was found advantageous to cover these runners with felt to prevent any possibility of subsidiary scratching. A hole was drilled vertically through the centre of this block to accommodate the stem of the second part of the apparatus. This stem could thus move vertically but not horizontally. The bottom of the stem contained the diamond point and on the top was fixed a small circular plate, used for carrying weights thus allowing the load on the diamond to be varied.

In use, the apparatus was laid on the enamelled surface and, guided by a straight-edge, was passed over the test area. The load was increased by 50 gm. increments and the above procedure repeated until a continuous visible mark was obtained. The assessment of the appearance of the scratch is difficult with light-coloured enamels and an indicator is required. It was eventually found that the best method was to apply a solution of a dye, such as Methyl Violet, to the surface before test and to perform the test with the indicator *in situ*. The criterion was whether a continuous line was produced. The only problem involved in the use of an indicator *in situ* was whether the indicator lubricated the scratching mechanism. If this was in fact the case, it was assumed that, for all practical purposes, the effect would be the same in all determinations.

This method showed a great deal of promise but, unfortunately, some drawbacks were encountered. The shape of the diamond and its alignment were found to be of great importance and thus it was found that, whilst any one diamond would differentiate between the members of a series of different enamels, correlation could not be established between different diamonds. It is pertinent to note, however, that a series of enamels was always placed in the same order by every diamond tried but that the loads required for the same enamel were different. It may be possible to arrive at some factor which would overcome this problem, particularly if diamonds cut very accurately to a predetermined shape can be employed. Work with this type of diamond was, unfortunately, never completed.

It is interesting to note in this connection that Morriss, as recorded in the Institute of Vitreous Enamellers Whittle Medal paper of 1951, worked on similar lines. The only substantial difference between his method and the one outlined above was in the production of the scratch. Whereas in the former method the diamond is moved over the test-plate, in the latter the plate is moved along underneath a fixed and suitably loaded diamond point. The indicator—ink—is also used *in situ*. The findings were very similar to those recorded above. Morriss, however, overcame the variation between different diamonds by reference to a standard enamel plate and claims that results can be expressed by the formula:—

$$\text{Scratch load} = \frac{\text{Load required to scratch test plate}}{\text{Load required to scratch standard}}$$

Results are then said to be of the order of + 5 per cent. accuracy with any diamond. This, if it can be substantiated, would seem to overcome the main objection to diamond scratch testing.

In a private communication to the Author, a method was described in which an attempt was made to assess a scratch-resistance by measuring the width of a mark produced by a diamond under standard conditions. Briefly the diamond was fixed to a carriage capable of running down an inclined rail system. This, by gravity, imparted a fixed speed to the diamond. By a suitable arrangement of cams, the diamond was lowered on to the test plate for a given run and subsequently raised again. By this method a standard reproducible scratch could be obtained. Several measurements were then taken along the length of the scratch and a mean value of these was used as a measure of the resistance. Unfortunately, as is usually the case with diamond scratches, the marks produced were very ragged and it was difficult to arrive at an absolute value. Though it was felt that this was a valuable research instrument, it would not be suitable for a standard test, due in the main to the difficulty of assessing scratch width which would occur between different operators.

The Author said that he had had an opportunity of investigating a micro-scratch apparatus. Here also, the raggedness of the scratch made any accurate measurement of scratch width impossible. In some cases, in fact, considerable overlapping

occurred. The wider parts of scratches on resistant enamels were often larger than the narrower parts on poorer enamels. These considerations, therefore, ruled out this method.

This apparatus was also capable of doing micro-hardness tests in which a pyramid was pressed into the surface under test. The size of the mark produced was taken as a measure of the hardness. Trials were made of this method also but again no conclusive results could be obtained.

American Test

The Author concluded his paper with a discussion of the American Porcelain Enamel Institute test for abrasion-resistance[3]. In this test a fixed test-plate is allowed to oscillate, causing a charge of steel balls, felspar and water to abrade the surface. The gloss of the specimen is measured before and after test, the difference being used as a measure of the attack. The method is claimed to be reproducible and to give results well in accordance with conditions observed in service and is, of course, widely used. It is, however, dependent on several factors, perhaps the most important being the availability of a given grade of felspar. It is important that this is exactly reproducible, otherwise the test is valueless. Secondly, standard glass plates are required for calibration. Thirdly, the apparatus, together with an instrument for measuring gloss, is quite expensive, and would perhaps be beyond the reach of many small enamellers.

There is some evidence, as yet unpublished, which suggests that good correlation has been obtained between results from the PEI tester and those from a diamond-scratch instrument. This, seemingly, is further evidence in support of the development of a relatively simple scratch test, particularly if further work confirms these rather early findings.

Finally, mention must be made of an abrasion-resistance test which has received little publicity but which may conceivably offer some prospect. In this method, carefully-graded steel grit—similar to that used in shotblasting—is allowed to fall by gravity from a pre-determined height, and at a controlled rate, and impinge on an inclined enamel surface. Limited experiments carried out using this technique showed that a "go or no-go" test was not a possibility but perhaps some results might be achieved if a loss of gloss measurement was incorporated as a criterion. The method might well deserve further investigation as to its suitability for a standard test.

It is apparent that the question of abrasion testing is still in an impasse. Provided that abrasion takes place only at the surface and is not allowed to proceed to the sub-surface layers, similar results can seemingly be obtained, whether scratch or abrasion tests are employed. Under these conditions abrasion might perhaps be regarded as a "multi-scratch" phenomenon rather than by its conventional meaning. The main difficulty would seem to be to decide when the surface ceases to be involved. There appears to be no doubt that the properties of the sub-surface layers are quite different from those of the surface and, as only in exceptional cases would resistance of the former be required, the emphasis should be placed on scratch or "multi-scratch" tests as opposed to deep abrasion. There would be less likelihood of ambiguity if one scratch is taken, rather than a very considerable number where repeated coverage of the same spots might well bring sub-surface resistance into play.

The main conclusions to be drawn, therefore, are that while both scratch and abrasion tests can and are being used to evaluate the abrasion-resistance of vitreous enamels, the problem of producing an absolute standard still looms large on the horizon. All the methods used have their drawbacks in one way or another. From the point of view of cheapness and simplicity, it may ultimately be worth while to try to develop further a diamond-scratch apparatus, even if the diamonds have to be specially prepared and individually standardized, since whatever method is finally adopted some form of standardization appears inevitable.

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[2] Ashby, R. H., and Niklewski, B. K., *Metal Finishing Journal*, **3**, No. 25.
[3] Harrison, W. N., *Proc.* Porcelain Enamel Inst., Form **3**, 32-37 (1938).

DISCUSSION

DR. B. K. NIKLEWSKI said that the question of the abrasion-resistance of enamels had been rather neglected for many years. But it was important, for parts of domestic appliances such as cookers and table tops, and also for some special industrial applications of enamel such as chutes for coal and ores, to develop a hard enamel having good abrasion-resistance. Unfortunately, in this country there was no standard procedure for measuring the resistance of abrasion and scratching. He was chairman of a sub-committee which had as its object the study of the problem in order to prepare a new standard. They had tried various methods and had found that it was extremely difficult to obtain reproducibility of results. Using the diamond test put forward by Laithwaite, the results could not be repeated when using another diamond, so that the committee did not feel able to put forward tests developed on the basis of the diamond test.

What the committee had done, therefore, had been to decide to follow the easy road and to imitate to a certain extent the PEI test which had been accepted in America for many years. The difficulty was to produce apparatus which would be simpler and cheaper but which would work with the same precision as the American apparatus, which was elaborate and expensive. It should be possible to produce some kind of standard if there was a simpler arrangement of that kind which could be used by enamellers. One difficulty was to measure the loss of weight but, from the papers which had been published on this matter, it would appear to be possible to assess the beginning of the wear of the enamel by careful weighing of the samples.

With regard to the loss of weight with time, there was a curve which would be specific for each

enamel and the abrasion of the surface and sub-surface was represented by a curve. The rate of abrasion changed suddenly when the surface finished and the sub-surface began to be abraded. It should be possible to devise a simple apparatus for measuring loss of weight. The development of a system involving the use of special diamonds would probably require a great deal of research and so it had been regarded as preferable to follow a road along which the Americans had already had some success.

Mr. Clarke has said a good deal about some work which had been done. It was a pity that this work had not been published. It was important to publish figures because, otherwise, a great deal of experimental work might be done and then lost and that should never be allowed to happen. Figures should always be published when they were available. Was there any possibility of publishing the results of the work to which Mr. Clarke had referred? That would be very valuable, whatever the results were.

Mr. Clarke said he understood that all the laboratory records had unfortunately been destroyed so that the figures relating to the tests in question would no longer be available.

Correlation of Properties

MR. A. W. MURDOCH said that when he read the paper he had been reminded of a paper, he believed of German origin, which he had read some time ago and which described an investigation comparing the wear-resistance in service of two enamels with their chemical corrosion resistance and scratch-resistance. Of these two enamels it had been found that one, apparently, had a good service life and the other was considered to have failed in that it became dirty very quickly and was difficult to clean. It had been found, however, that these two enamels had approximately the same chemical resistance to a series of chemical corrosion tests and also the behaviour in the scratch-resistance test, which had been done with a diamond, had been similar in regard to the weight taken without giving a scratch.

There had been an investigation to find out, therefore, why one enamel had failed and the other had apparently been successful. It had been found, on examining the scratch, that on the one which had passed it was a smooth, regular scratch, while on the one which had failed it was irregular and rather difficult to define. The surface of the enamel had then been examined and it had been found that on the surface of the enamel which was considered to be satisfactory the distribution of the opacifier in the enamel was homogeneous and there was a regular bubble structure which was low. In the other enamel the bubble structure was much higher and the opacifier was irregularly distributed through the enamel surface. A series of tests had then been done in the laboratory on cleaning the enamels and it was found that when the surface was dirtied it took five or six times the amount of cleaning to clean the one which had failed than was required for the other, and it opened more bubbles, so that it became dirtier more quickly. Perhaps, therefore, the scratch-resistance might not give the relationship between service life and the actual figures obtained for enamels.

MR. E. W. B. DUNNING said that thirty years ago he had been responsible for applying the original Mohs' scale of hardness test but he did not want to give the impression that it was thought it should be retained now if there was a better test available. But he was surprised that, although Mr. Clarke had dismissed the Mohs' scale, he had not produced any evidence to justify this. It might be said that the Mohs' scale tended to classify enamels all in one grade but it might be found in practical conditions that, after a new test had been produced which divided them into different, finer grades, when enamels came to be used on appliances, the wider classification would have to be used again because the scratching was often by abrasive cleaning-powders, under which they all tended to show the same kind of hardness. He had himself tried out the Laithwaite diamond test but had had to abandon it and go back to the Mohs' scale of hardness test. Sometimes, it was difficult to see scratches but, if the test was carried out in a darkened room with one electric-light bulb, by turning the surface it was possible to see a lot of scratches which were not visible on casual inspection.

Two Kinds of Abrasion

There were two kinds of abrasion, the cleaning-powder abrasion and that due to the movement of pots and pans and so on, on the surface. Whenever the industry thought that it had produced satisfactory apparatus, it would be very useful to obtain some comparisons and the North Thames Gas Board would be ready to carry out tests in their own laboratory with the apparatus, relating them to district conditions. He felt that they were in a better position than anyone else to obtain such comparison because they knew where all the appliances went. They could go to the house and ask to see them and they did so.

That was something they were prepared to do. If a manufacturer produced two enamelled crown trays, of which one was thought to be better than another, they would be prepared to buy 100 of each kind and put them in houses, leave them for a year and find out in the end which was the better. That was the only practical way of doing it.

He had been doing tests recently on the ease of cleaning of enamel, which also involved the question of abrasion and of what were the best materials to advise the customer to use. It was all very well to tell the user to clean it when it was hot and to use hot soapy water but, if the hot soapy water did not get the dirt off, it would be no use. The use of wire wool for cleaning had been considered and which gauges of wire wool would get the dirt off and not scratch the enamel. It had been found up to now that something which contained some detergent and abrasive and wire wool seemed to be the most satisfactory.

Dr. Niklewski, commenting on what Mr. Dunning had said, remarked that it was true that some enamels were very hard and some were soft but that, after a time in use, there would be no difference between the scratches produced in the hardest and those in the softest enamels. Probably Mohs' scale would put them all in one bracket but a tool was necessary which would show a difference between one enamel and another or no progress would be made. An interesting fact about abrasion was that pots which were enamelled with the softest enamel would scratch the surface of the hardest enamel. Why that should be so was not known but glasses were very different in their structure, so that a good deal of research had to be done on this matter.

MR. S. E. A. RYDER said that nearly always when this problem was discussed the cost of the apparatus was mentioned and they seemed to fight shy of certain suggested methods because it was said that the apparatus would be costly and would be beyond the reach of the smaller enameller. In his view that was not a good way to look at the problem. Probably two methods were required. Mr. Clarke had mentioned a standard method; a standard method need be only a "go" or "not go" method and Mohs' scale was quite simple from that point of view and would probably fully satisfy all the needs of the smaller enameller. For research and development work, however, something more elaborate was needed and probably something quite different. For that work they ought not to fight shy of a little expense.

German Test

MR. J. C. BAILEY said that in the aluminium industry they had had cause to try to develop a method of measuring abrasion resistance in order to improve the anodic films which they had a habit of putting on aluminium and they had come hard up against more or less the same problem as that now under discussion. It might be of interest to the meeting to know that a good deal of effort had been put recently into a development of one of the methods mentioned by Mr. Clarke—that in which an abrasive fell on the specimen—but they had taken this much further and developed what was called the Schon test, which had originated twenty years ago in Germany.

The essence of this test was that, instead of the abrasive falling on the specimen, it was projected against it under air pressure. The apparatus was very simple, consisting of an 8-in. glass tube of $\frac{1}{8}$-in. bore, surrounded by a wider tube which projected beyond it downwards on the specimen mounted underneath at an angle of 45 degrees. The abrasive fell down the outer tube in a controlled manner and air under pressure came through the inner tube. The resulting abrasion-resistance was measured in terms of the weight of abrasive required to remove the anodic film and was expressed in terms of the weight of abrasive per micron thickness of film.

That apparatus was the only one which had been developed and he had to admit that they were having just the same troubles with it as were encountered with other apparatus for the same purpose, in that they could not get reproducibility of the results between one apparatus and another and between one anodic film and another. They were not sure whether the troubles lay in the variations in the apparatus and methods of doing the test or in the anodic film itself. However, attempts were being made to streamline the whole thing and to use, perhaps, metal tubing and make the flow of abrasive under pressure much more uniform and controlled. In that way they hoped to bring the reproducibility to within acceptable limits.

It occurred to him that possibly such an apparatus might be of value on vitreous-enamel finishes. The powder could be blown on to remove a given thickness—just the surface layers, if that was what they were concerned with—and find the weight of abrasive required to do that, or go right through the enamel and find the specific abrasive-resistance per unit of thickness. This test, though still imperfect, had been put in the British standard for anodic oxidation finishes, of which a revised edition would be coming out soon, but he did not regard it as a satisfactory test, even though it had achieved the status of a British standard.

MR. G. A. GREENWELL, referring to the little diamond testing instrument which Mr. Clarke had mentioned, pointed out that this had been designed mainly, if not entirely, for frit development work in the laboratory and had not been as such thought of as a universal test. He had found it very useful, reliable and reproducible for the purpose for which it had been employed. At that time the I.V.E. had been trying to find a universal test and Mr. Laithwaite had got them to make four or five of these little instruments up and send them to various members of the Institute for their evaluation. It had been very difficult to find five diamonds which gave the same result. One of the drawbacks had been that the sliding peg in the hole in the block could not be very loose or there would be rocking, while if it was too tight the friction inside the machine led to rather a higher result than would normally be obtained. Great care had been necessary in the manufacture of the sliding parts.

Consolidated Pneumatic's New Factory

Work has begun on a new factory at Muland, on the outskirts of Bombay, for the manufacture of pneumatic power tools and plant. It will be the first full-scale production unit in the country to specialize in the field of compressed air. The project is the result of plans developed by the Consolidated Pneumatic Tool Company, Limited.

The new factory, which is expected to be completed about the middle of this year, will have an all-Indian labour force in the region of 300 to 400 when it comes into full production. To this end Indian personnel are already being trained at the works of the parent company in Fraserburgh, Scotland. This new manufacturing centre will be operated by Consolidated Pneumatic's Indian subsidiary, the Consolidated Pneumatic Tool Company India (Private), Limited.

Canadian Hot-blast Water-cooled Cupola

(Continued from page 146)

By J. E. Rehder

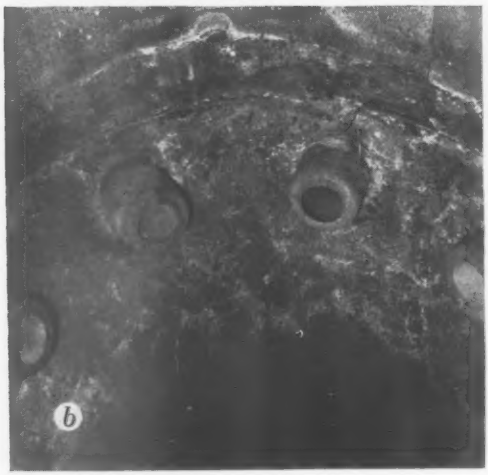
Since the publication of his paper in Canadian Metalworking, *Mr. Rehder has submitted the appendix and the further illustrations which are reproduced in what follows. The main points discussed have arisen from actual practical experience in banking the furnace overnight and the author describes an important change in procedure in addition to recording a note about the economic grounds on which it was made.*

APPENDIX

Banking Overnight

Since the article on the hot-blast, water-cooled cupola at the National Iron Division plant of Canada Iron Founders, Limited, was written, in late 1957, further experience has been gained on the the question of banking overnight and the conclusion is not as originally expected. On one-shift operation, banking overnight instead of dropping the bottom involves keeping a fire going in the cupola for 16 hours out of each 24. This, it was thought, would consume a considerable quantity of coke and the only justification was eliminating the cost of a new sand bottom. However, trials were made, with surprising results.

The practice now is to melt down to the bed at the end of the day as usual, and then to drain the well of slag and iron through the drain outlet of the front slagging-spout. This also permits patching of the front slagging-spout and repair of the tap-hole. The tap-hole is left open, but all other open-



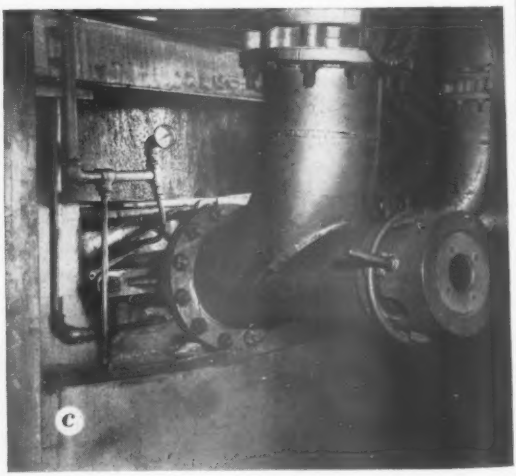


FIG. 4.—*Additional features of the Canadian hot-blast cupola:*
(*a*) *Tapping-box and slag weir; note the slag overflow into the water stream.*
(*b*) *View of the interior of the furnace, showing the protruding water-cooled tuyeres.*
(*c*) *Exterior of the furnace at tuyere level; the water connections to the tuyere and temperature gauge at each tuyere location are worth noting.*

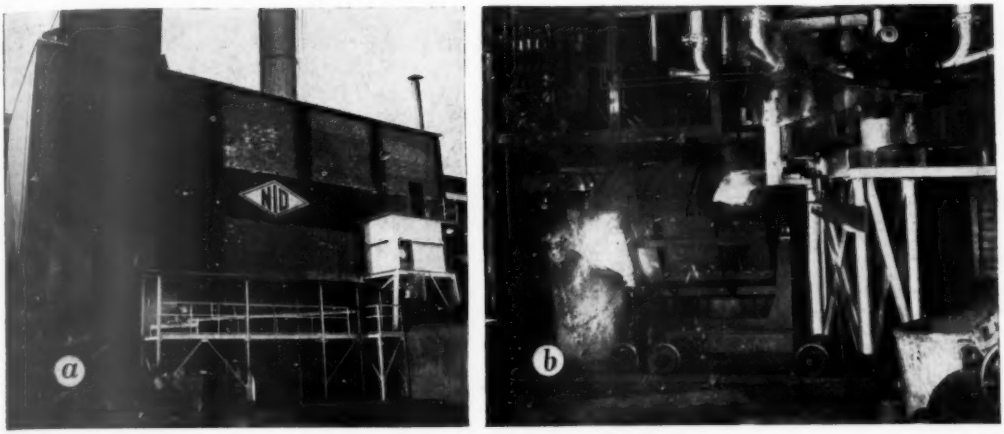


FIG. 5.—*General views of the arrangements for servicing the Canadian cupola; (a) charging plant viewed from the stockyard. The weighing scale and conveyor for delivering coke are clearly visible; (b) molten-metal collection—note the use of a receiver carried on a bogie.*

(All the illustrations of the Canadian cupola are reproduced by courtesy of Macleod-Gilbert A. Milne & Company, the photographers.)

ings such as tuyeres and blast gate are shut as tightly as possible to keep uncontrolled air infiltration to a minimum. The cupola is left in this condition over the next two shifts, the coke remaining in the cupola burning very slowly on air through the tap-hole.

The next morning the bed is made up to correct measured height with fresh coke and a little air blast is applied to freshen it up. Charging is then started, the tap-hole, repaired if necessary, plugged with sand, and everything then conducted as for a normal fresh morning start-up. There has been no difficulty with this procedure. The surprise comes when the amount of coke consumed per week is tallied, for actually less coke is used when banking over than when dropping the bottom every night.

A fresh bed takes 4 short tons of coke, with 0.5 tons recovered from the drop. This comes to a net consumption of 17.5 short tons of coke for a five-day week, dropping bottom each day. The amount of coke necessary to make up the bed each morning when banking over is 2.25 short tons. Considering a 4-ton bed Monday morning and 0.5 ton recovered from the drop on Friday, a net consumption of 12.5 tons of coke per week is encountered when banking over two shifts. Since it takes 5 short tons less coke per week to bank over than to drop each night, obviously there is no economic disadvantage, and the total saving is the cost of the coke saved as well as the cost of materials and labour for four new sand-bottoms. Needless to say, standard practice is now to drop the bottom only once per week.

Westinghouse Prospects

Orders received by the Westinghouse Brake & Signal Company, Limited, and its subsidiaries in 1956-57 greatly exceeded the previous year's record and despatches reached an exceptionally high total, states the chairman, Capt. A. R. S. Nutting, in his annual review. Valuable improvements in the results of Australian, Indian, and South African subsidiaries were a major factor in the good trading results. Another important factor was the conversion of a substantial loss by Douglas (Kingswood), Limited, into a small trading profit.

The current year promises well and more capital expenditure must be faced to give needed facilities, but assuming "peace and normal working" in the industry, the year should be as satisfactory as 1956-57. A one-for-one scrip issue and a two-for-three rights issue at 35s. per £1 share, resulted in £3,000,000 of new money, enabling the parent company to repay the £1,104,949 bank overdraft and to meet some of the more urgent financial needs of several of the home subsidiaries.

Yugoslavia's Record Steel Output

Over 1,000,000 tons of steel was produced in Yugoslavia last year—an all-time record for the industry. In 1956, 887,000 tons were produced and before the war the annual rate of production was about 235,000 tons. The country's major steelworks—Zenica—exported 91,671 tons of rolled steel last year and 15,289 tons of tar and lead, by-products from the plant.

The value of 1957 exports by Zenica was $11,000,000, but there is likely to be a reduction in this year's total owing to a growing demand for rolled steel from the home market.

Under a protocol covering trade in 1958 between Yugoslavia and Hungary, Yugoslavia's exports will include iron ores, non-ferrous metal products, machines, and electrical energy, while Hungary's deliveries to Yugoslavia will include pig-iron and rolled material.

MONSANTO CHEMICALS, LIMITED—Dr. G. Valerio has been appointed a director.

Foreign Economic Reports

The following extracts have been prepared from recent economic reports emanating from the Export Services Branch of the Board of Trade. In each case an attempt is made to include mention of trends which may influence foundry business.

Finland: Unemployment reached serious proportions during the last few months. On November 15 the number of unemployed was 41,073 as against 15,761 on the corresponding date in 1956. By November 22 the total number of registered unemployed had risen to 44,885. The problem is not confined to any particular industry but among the principle sufferers are the metal and building industries. At 197 (1948 = 100) the index for industrial production for October was some 6 per cent. higher than in September; there were, however, two more working days in October. Compared with October 1956 there was a decrease of 6 per cent.

Th managing director of Otanmäki Rolling Mill said in a Press interview that it might be possible to obtain foreign credits for about half of the £20,500,000 needed for the project, but a decision by the Government to go ahead would have to be taken quickly so that trial runs could begin in 1962. It has not yet been decided where to erect the mill.

Belgium: Despite the fact that the index of industrial production reached a record height in the October of last year, signs have been multiplying that the recent period of rapid expansion is likely to give way to one of consolidation or even slight recession.

In spite of such signs, there was no slackening in industrial activity in October. Most industries achieved a higher output than expected, and the overall industrial production index rose 8.1 points compared with September's (revised) figure of 118.0, to 126.1—a new record. All that can be said at present is that the rate of expansion in 1957 has in most industries been at a slightly lesser rate than in 1956. Steel production at 586,000 tons established a new record, exceeding the previous highest monthly total, in October 1956, by 16,000 tons. With prices weakening, blast furnaces are working to capacity to avoid having orders cancelled and to offer early delivery for new business. In the engineering and metal-working industries production in October was the highest since March. Reports indicate a slowing down in the rate of new orders to about 15 per cent. less than the average for the first half of the year.

Brazil: The budget for 1958 provides for an estimated deficit of approximately £200,000,000. The official cost of living figures for October 1957 showed no increase over September. More wage increases were granted during November 1957 and other claims are pending.

The Chrysler Corporation have obtained approval for the manufacture of passenger cars in Brazil. They intend to begin production at the rate of 6,000 cars a year with 65 per cent. by weight of locally-made parts. The Sociedade Tecnica de Fundicoes Gerais (SOFUNGI) S.A., of Sao Paulo, has reached an agreement with the National Malleable and Steel Castings Company of Cleveland, Ohio, for the manufacture, on a royalty basis, of malleable iron. Acos Villares S.A., of Sao Paulo, is to produce high-speed cobalt for tool manufacture. Aluminio Industrial S.A. is building a new factory at Pindamonghangaba, State of Sao Paulo. It is expected to be in operation in the second half of 1958. A deposit of autunite has been located near Belo Vale, a small town about 50 miles south of Belo Horizonte, in Minas Gerais. Prospecting is still in progress and the importance of the deposit is not yet known. There was considerable activity in the wage and salary field during November 1957 and increases were granted to steel workers in Volta Redonda and to metal workers in Lafaiete and in the State of Parana.

Germany: There was no sign of the autumn boom which had been expected in some quarters. Business picked up again after the summer holiday season, but the level of activity was not significantly higher than during the previous year. In general, the economy tends to be sluggish although employment remains at a high level and the current level of exports is good. Table I shows the output of the German iron and steel industry for the period January to October, 1957:

—	Jan.-Oct., 1957.	Jan.-Oct., 1956.	Change.
	Tons.	Tons.	
Pig-iron	15,205,749	14,613,209	+4 per cent.
Crude steel	20,343,915	19,330,772	+5 per cent.
Rolled-steel products	13,693,811	13,053,622	+5 per cent.

Sweden: From Sweden come reports of workmen being laid off in the engineering shops and in the metal finished-goods industry. The iron and steel industry reports a considerable decline in new orders and although no appreciable cuts have been made in output some curtailment may soon be necessary. In a recent statement from the state-owned Norbottens Ironworks it is said that owing to intensified competition, particularly in overseas markets, the firm had had considerable difficulty in disposing of its output last year. In an effort to increase sales, prices have been temporarily reduced below the level of costs; output is not, however, being reduced and no cuts in the labour force are contemplated at present. Other Swedish iron works have also recently experienced a falling off in new business. At Sandviken the value of new orders for certain products was as much as 30 per cent. lower than during the first nine months of 1956. AB Fagersta Bruk also has fewer new orders and the Uddeholm company has been forced to lay off workmen at its iron pipe works at Storfors. Some 650 employees at the Bolinder-Munktell tractor factory at Eskilstuna have been working a four-day week due to difficulties in disposing of tractors both at home and abroad. The main reasons for the decline seems to be the poor harvest and tightened import restrictions by France and Brazil. An agreement has been reached between the UK and Sweden regarding co-operation in the peaceful uses of nuclear energy. The agreement is intended to facilitate the exchange of information about nuclear reactors and the purchase in the UK of experimental reactors and the necessary fuel.

Grooming for Foremanship

A scheme for six months' training for employees before they take up positions as foremen has been launched by the Steel, Peech & Tozer branch of the United Steel Companies, Limited, Rotherham. During the training period the men have the status and pay of foremen and it ends with understudying the men they will succeed—usually foremen retiring or promoted.

A special feature of the training is a three weeks' course in foremanship at Leicester or Leeds technical colleges. At the works they are given a knowledge of planning, work study, and various service departments, and an idea of the work in neighbouring production departments.

Notes from the Branches

Social Functions

Three of the principal branches of the Institute of British Foundrymen held their premier annual social events in January. At the London branch function, held in the Grand Hall of the Connaught Rooms, about 300 members and their ladies attended and were chaired by Mr. A. Talbot, branch president. Mr. and Mrs. J. Blakiston, the national president and his wife, were the chief guests. An excellent dinner was followed by dancing to the Peter Alan Trio and Sextet until midnight and those present were entertained by Henry Smith Hampshire and Doreen Green and trampoline artists, Beryl and Bobo. The "Loyal Toast" was proposed by Mr. Talbot and the toast to the "London branch and the Ladies" by Mr. Blakiston; Mr. Talbot responded to the latter.

The London function was purely a domestic affair, but slightly more formal, and with more guests, was the dinner/dance of the Lancashire branch held at the Grand Hotel, Manchester, under the chairmanship of Mr. E. H. Beech and with Mr. F. A. Harper, Mr. C. M. G. Wallwork and Mr. S. Heginbotham acting as stewards. Again, about 300 members and guests attended. Following the "Loyal Toast," that of the "Lancashire Branch" was proposed by Mr. Blakiston and responded to by Mr. Beech; the "Visitors" was proposed by Mr. H. Booth, branch senior vice-president. In responding, Mr. A. C. Main, director of Metropolitan-Vickers Electrical Company, Limited, referred to the Zito-Zero energy project (then newly announced) and commented that exotic things like that were all very well, but foundrymen—and his firm had a large foundry—earned their "bread-and-butter" making the "ironmongery" necessities of life. Following Mr. Main's speech, Mr. F. W. Nield, branch honorary secretary, proposed the toast to "The Ladies," to which Mrs. Beech responded. Next, a toast to the branch secretary was proposed by Mr. Wallwork. At the conclusion of the dinner, those who wished to do so danced to the music of the Grand Hotel orchestra, the masters of ceremonies being Mr. H. Booth and Mr. R. Masterton. Earlier, in the afternoon of the same day "cards" enthusiasts had played whist under the stewardship of Mr. G. C. Studley and Mr. R. Masterton, the whole making a very successful function.

At the Birmingham branch function, attendance was limited to about 250 by the dining capacity of the Botanical Gardens, Edgbaston, which, however, provided a quite exotic setting for the event. Here the president Mr. J. W. Dews, had as his principal guest Dr. Richard Weck, director of the British Welding Research Association, and interplay between foundry and welding topics provided amusing inspiration for the speeches. Dr. Weck proposed the toast to the branch, and in more serious vein said that education and training for industry was vital not only to prosperity but also to fundamental survival. Welding and iron-founding rarely had much glamour attached to them, he said, and the young brains of the country failed now and then, perhaps, to appreciate that the production of earth satellites and development of atomic energy would be impossible without the basic crafts of the

The illustrations show reception groups at the annual dinners of the London and Birmingham IBF branches. On the extreme left is Mr. J. Blakiston, IBF national president, and Mrs. Blakiston, supporting Mr. A. Talbot (London branch president) and Mrs. Talbot at their function in the Connaught Rooms. In the other picture, Mr. J. W. Dews (Birmingham branch president) and Mrs. Dews are shown (centre) welcoming Mr. and Mrs. D. F. Bailey; Mr. and Mrs. Blakiston are also in this reception party (extreme right).

Notes from the Branches

metals industries. He added that one of the most important achievements of foundrymen had been the creation of the National Foundry College, and the welding industry was now trying to follow this lead and start its own training college on similar lines. Mr. Dews who responded said in essence, that the iron-founding industry was willing and ready to face the challenge of the modern atomic age.

Mr. E. R. Dunning, branch past-president, proposed the toast to "The Guests" and Mr. Blakiston (who, with Mrs. Blakiston, attended this function also) in his reply congratulated the branch on being the second largest in the country, with membership now in the region of one thousand. Dancing commenced at 10 p.m. to the music of Frank Carter and his orchestra, and continued until 2 a.m., with a break for a buffet supper at 11.15 p.m.

Slough

The Slough section has arranged an unusual works visit to precede its Social Evening on April 25. The "shops" to be visited are those of the British Overseas Airways Corporation at London Airport. The complete tour will cover a distance of about 10 miles within the Airport boundaries, and will include visits to the maintenance workshops, hangars, etc., together with the inspection of an aeroplane. Later on, dinner will be taken in one of the passenger restaurants at the Airport. The coach carrying the party (which will include ladies and guests) will leave the Slough Social Centre at 6 p.m., picking up members *en route* as desired. It is essential that all members travel by this coach as it will be the one in which the tour of the Airport is made. Obviously, only a limited number can be accommodated so that those who wish to participate should send in their applications as soon as possible to the secretary, Mr. R. J. Bown, c/o B. J. Griffin & Son, 47, Bath Road, Slough. The cost of the evening will be £1 per head, and no applications will be considered after March 18.

Iron-ore Imports

Iron ore imports in December, and the totals for 1957 and 1956 are shown below.

From	Month ended Dec. 31.	Year ended December 31.	
	1957.	1956.	1957.
	Tons.	Tons.	Tons.
Sierra Leone	43,750	689,641	728,819
Canada	59,215	2,495,290	3,040,417
Other Commonwealth countries and Eire	16	14,342	15,040
Sweden	359,960	4,358,010	4,279,102
Norway	17,504	120,211	233,388
Western Germany	—	3,175	2,604
France	46,361	590,910	624,862
Portugal	3,350	120,303	133,343
Spain	57,564	827,491	1,030,581
Algeria	140,864	1,421,086	1,515,368
French West Africa	53,938	613,167	608,405
Tunisia	72,038	799,888	739,961
Northern Morocco	21,740	270,178	234,683
Southern Morocco	35,990	380,369	402,346
Liberia	32,980	340,437	349,878
Brazil	43,618	546,029	677,834
Other foreign countries	154,100	739,577	1,302,684
TOTAL	1,142,988	14,330,104	15,919,315

British and World Shipbuilding

Steamships and motorships under construction in Great Britain and Northern Ireland at the end of December totalled 341 ships of 2,345,408 tons gross, an increase of 104,677 tons compared with the previous quarter, states Lloyd's Register of Shipbuilding returns relating to merchant ships of 100 tons gross and upwards. The vessels included 72 steamships of 1,070,112 tons and 267 motorships of 1,274,995 tons. In other British Commonwealth countries there were under construction 9 steamships of 53,433 tons and 26 motorships of 88,806 tons. Oil tankers building in Great Britain and Northern Ireland totalled 75 ships of 1,048,409 tons, an increase of 43,700 tons compared with the previous quarter. The tanker figure represents 44.7 per cent. of the total tonnage under construction in this country. Vessels building in the world numbered 1,681 of 9,947,977 tons (including four wooden ships of 830 tons), compared with 1,737 of 9,350,553 tons in the previous quarter. The total included 312 steamers of 4,378,318 tons, and 1,365 motorships of 5,568,829 tons. Construction in hand in the principal districts of Great Britain and Northern Ireland is indicated in Table I.

TABLE I.—*Shipbuilding Construction in Hand in Principal Districts of Great Britain and Northern Ireland.*

District.	December 31, 1957.		September 30, 1957.		December 31, 1956.	
	No.	Gross tonnage.	No.	Gross tonnage.	No.	Gross tonnage.
Aberdeen ..	16	22,879	18	23,142	22	31,052
Barrow ..	3	88,140	4	108,770	3	62,910
Belfast ..	19	303,055	19	291,339	19	243,687
Bristol ..	3	1,080	3	2,160	4	2,451
Clyde—						
Glasgow ..	72	456,296	74	448,854	66	455,159
Greenock ..	28	181,048	30	202,308	28	180,955
Dundee ..	7	47,300	6	38,700	6	40,040
Hartlepool ..	8	65,560	7	54,600	7	48,853
Hull	30	18,446	36	18,884	38	21,454
Leith	13	66,540	11	47,820	12	56,000
Liverpool ..	16	156,168	15	161,340	17	160,901
Middlesbrough	16	198,278	16	208,633	14	182,593
Newcastle-on-Tyne ..	41	446,480	40	401,720	37	414,750
Southampton	9	6,650	6	4,000	4	3,570
Sunderland ..	32	259,108	27	199,249	28	217,696

The sizes of steamships and motorships (in parentheses) under construction in Great Britain and Northern Ireland included the following:—100 to 1,000 tons, 13 steam (92 motor); 1,000 to 2,000 tons, 1 steam (25); 2,000 to 4,000 tons, no steam (19); 4,000 to 6,000 tons, 1 steam (22); 6,000 to 8,000 tons, 2 steam (28); 8,000 to 10,000 tons, 6 steam (48); 10,000 to 15,000 tons, 15 steam (30); 15,000 to 20,000 tons, 5 steam (2); 20,000 to 25,000 tons, 16 steam (2); 25,000 to 30,000 tons, 7 steam (nil); 30,000 tons upwards, 4 steam (nil).

Of the steam and motor merchant ships under construction throughout the world at the end of December, 5,526,092 tons (55.5 per cent.) are under the inspection of Lloyd's Register. Of this total, 2,258,453 tons, representing 96.3 per cent. of the tonnage being built there, are under construction in Great Britain and Northern Ireland, while, of the tonnage being built abroad, 3,267,639 tons (43 per cent.) are to be classed with Lloyd's Register of Shipping.

METAL INDUSTRIES, LIMITED, Glasgow, has undertaken to remove the Granton trawler Luffness from the ledge in the Aberdeen harbour channel where it ran aground recently.

Work of PERA in 1957

Developments which took place at the Production Engineering Research Association during 1957 included the occupation of a new research block costing £250,000, and the creation of a new education and training department. More than 120 large and small firms in a wide range of industries joined the Association during the year. About 230 special problems and projects were also undertaken for individual member-firms and a number of general investigations were conducted.

These included research into the drilling of cast iron, investigations being carried out to determine the most suitable point shapes for drilling various steels. Significant increases in drill life have been achieved with point shapes differing from those conventionally used in production workshops. Current research includes an investigation on an automatic lathe to compare three types of high-speed steel when machining alloy steel. The opportunity is being taken during this investigation to investigate the relationship between tool wear and workpiece diameter.

An investigation, now almost complete, into the performance of a range of makes of ceramic tools when turning alloy steel has been carried out. Comparison tests have been made with cemented carbide tools, performance being assessed on the basis of tool wear in roughing operations and on workpiece surface finish and wear in finishing operations. Field research into problems concerned with cutting-tool performance emphasized the need for improving grinding techniques and a greater degree of control. An investigation in which conventional and unorthodox methods of grinding carbide tools were studied indicated that the speed and ease of grinding associated with a particular method were of considerable economic significance.

Sliding Surfaces and Cutting Tools

An investigation into the accuracy and performance of several makes of cylindrical grinding machines has been completed, and substantial progress has been made in an investigation into various aspects of machine-tool slideway lubrication and slideways. A report is being prepared on the influence of scraped surfaces, lubricant viscosity, load per unit area, and sliding speed on the transition from boundary to hydrodynamic lubrication. Practical tests are also being carried out to determine the friction properties of various lubricants and machine-tool slideway materials.

It is not generally realized that present limits of feed, speed, tool life, surface finish, and accuracy in many production operations are often set by the vibration characteristics of machines and cutting tools. By using experimental vibration absorbers (Fig. 1) now being developed by PERA, excellent surface finishes can be produced in some machining operations under conditions which otherwise result in severe chatter, rough surfaces, and in extreme cases, tool breakage. Other investigations have indicated that the reduction or elimination of vibration often obviates the need for subsequent finishing operations such as reaming or grinding, thus reducing machining times and costs. Several member-firms have seconded engineers to the Association for periods of training lasting at least 12 months. These engineers receive instruction in subjects necessary for complete understanding of vibration phenomena ,and also assist PERA staff engaged on practical research into vibration.

In the field of automation, a report on hoppers and selector devices was recently issued to members and subsequent reports will cover work-loading equipment such as magazines; mechanical hands; iron hands; work-clamping equipment; work conveying equipment; the application of various types of automation equipment in machining operations; and transfer machine tools and presses.

FIG. 1.—*Member-firm's engineer seconded to PERA for a course of training in vibration research, carrying out tests on an experimental damped boring bar.*

To assist members in making the most effective use of research results and recommendations, approximately 800 visits were made by PERA engineers to factories in all parts of Britain during 1957.

New Laboratories for Nuclear Research

New laboratories costing over £1,000,000 for research and development in the nuclear field are to be built by C. A. Parsons & Company, Limited, engineers, makers of turbines, turbo-electric generators, etc., of Newcastle-upon-Tyne. Announcing this, the company has stated that the past year or so had indicated "exciting possibilities of greatly improving present designs which would lead to lower construction costs and higher efficiency." Greater effort in research was essential to maintain the lead which Britain held today in nuclear power, and the new laboratories would enable the company to increase its own efforts.

Sir Claude Gibb, chairman of the company, said the project would make Heaton a major centre of peaceful nuclear research and bring more work to the north-east. Building should begin shortly and be completed by the end of the year. The laboratories will house the digital computer recently ordered by the company and due for delivery at the end of the year.

BTH Gift to Rugby College

Receipt of the first instalment of a gift of £25,000 made by the British Thomson-Houston Company, Limited, to the Rugby College of Technology and Arts, is announced by Warwickshire Education Committee. The gift will go towards the cost of the halls of residence now being erected in the college grounds.

The establishment of sandwich courses for students in the engineering technologies, and for which the halls of residence are being provided (the first, it is thought, to be built by a technical college), is a noteworthy landmark in the relations between college and industry. The company has played a prominent part in the growth in importance of Rugby College as a centre of technical education.

Zinc Alloy Die Casters' Association "Open Day"

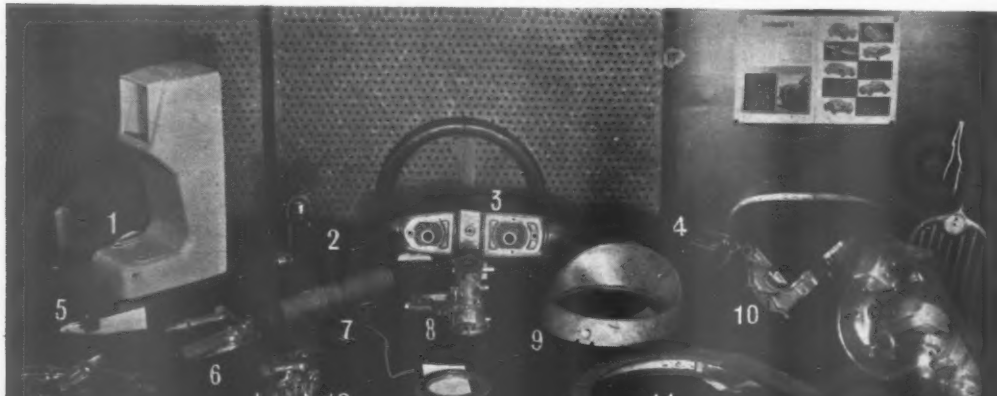
With the particular objective of popularizing their new design standards for pressure-die-castings and the general aim of showing what the industry is capable of, the Zinc Alloy Die Casters Association staged an "Open Day" at their Berkeley Square headquarters in London at the end of last month. The new standard has already been publicized in this JOURNAL*, and it was pleasing to learn from chatting with the Association's staff that it has aroused wide interest amongst customers' engineers, in addition to die-casters themselves.

The exhibition of specimen zinc-alloy die-castings, which was a feature of the function, proved most attractive there being dozens of well-turned-out castings on show, some large and of high complexity and others quite small. A photograph (specially taken for this JOURNAL) of one of the exhibition tables is reproduced to accompany this report; though it shows but a fraction of the designs on view it does exemplify the wide range of consumer industries served by the pressure-die-casting foundries. At various times during the day, film shows were staged and at each of these a "full-house" was reported. The Association is to be congratulated on its enterprise in preparing such a worthwhile programme; the support accorded the function must have exceeded even their most optimistic forecasts.

* December 15, 1957, issue of the JOURNAL, p. 664.

FIG. 1.—*One of the tables at the ZADCA exhibition held recently at the Association's headquarters in Berkeley Square, London.*

KEY :—
1. Weighing-scales frame.
2. Sink waste-trap (chromium plated).
3. Automobile tail-lamp housing.
4. Automatic clawbolt rim lock.
5. Electric-iron lamp grille.
6. Paint spray-gun handle.
7. Telescopic shock-absorber body.
8. Carburettor body.
9. Automobile headlamp surround.
10. Textile-machine bracket.
11. Petrol-pump handle (chromium plated).
12. Carburettor body.
13. Laundry marking-machine numbered wheel.
14. Bacon-slicer blade-guard.
15. Washing-machine gearbox housing.



Glasgow and Smokeless Zones

Glasgow needs between 1,000,000 and 2,000,000 trees, but first it must have a smokeless zone in which plant life could survive, said Mr. D. P. Bliss, director of the Glasgow School of Art, in an interview recently. It seemed madness to him not to make a start. Sir Patrick Dollan, chairman of the Scottish Fuel Efficiency Committee, agreed that there had been too much talk about a smokeless zone for Glasgow and not enough action. Other Scottish towns were dealing with the problem and the coal-producing county of Lanarkshire had 33 smokeless zones.

The supply of smokeless fuel was no hindrance, he said, and Scotland could have 800,000 tons of such fuel a year. In about five years when the Hunterston nuclear power-station got going, there would be enough power to supply an electrically-minded Glasgow and the west of Scotland.

Dinner

INSTITUTE OF VITREOUS ENAMELLERS

The Midland Section of the Institute of Vitreous Enamellers held its annual dinner at the Station Hotel, Dudley, on February 7. Mr. D. Sleath, the section secretary, very ably organized the event and 65 attended. Following the "Loyal Toast" proposed by Mr. L. Bayliss, section chairman (Ferramic Industries, Limited), Mr. W. E. C. Stuart, of Stuart & Sons, Limited, Stourbridge, and a prominent member of the Society of Glass Technology, proposed the toast to "The Institute" and Mr. Bayliss responded. The subsequent proceedings were informal and members were entertained by Mr. Bastick on the piano. It was a "men only" party, the section having arranged for a ladies' night to be held on March 7.

Company News

WILLIAM DENNY & BROS., LIMITED, shipbuilders and engineers, of Dumbarton—The issue of 125,000 ordinary £1 shares will be made on the basis of one new share at 32s. 6d. for every two ordinary stock units held.

MORGAN CRUCIBLE COMPANY, LIMITED—The company has acquired a further holding in the Ship Carbon Company of Great Britain, Limited, and in part consideration has issued £100,740 of its "A" ordinary shares credited as fully paid up, and converted into "A" ordinary stock of the company.

TECALEMIT, LIMITED, lubrication, hydraulic, and filtration engineers, of Brentford (Middx)—A full order-book and a factory working to capacity is reported by the chairman, Mr. S. G. Gates. Results for the current year should show a definite improvement on those for 1956-57, when group profits declined to £131,949 (£160,437) and the dividend was reduced to 11 (13) per cent.

TUBE INVESTMENTS, LIMITED—The Wright Saddle Company, Limited, leather manufacturers, of Birmingham, has received a conditional offer from the company to purchase its £170,625 issued capital on the basis of one TI ordinary £1 share for every 11¼ shares in Wright Saddle. This represents the equivalent of 4s. 6d. per share. The directors of Wright Saddle unreservedly recommend shareholders to accept the offer and have informed TI that they are prepared to accept it in respect of their own holdings.

BTR INDUSTRIES, LIMITED (formerly the British Tyre & Rubber Company, Limited)—While the volume of trading was substantially maintained, the reduction in profit was largely due to the highly competitive conditions which prevailed throughout the year, particularly in the belting field, state the directors. Group profits contracted by £457,000, and the dividend is maintained at 15 per cent. with a 10 per cent. final for the year ended September 30, 1957. Group profit was £1,295,804, and net profit was £564,144 (£853,774), after tax.

JOHN BROWN & COMPANY, LIMITED—The company has declared an interim dividend of 4 per cent., less tax, on £9,181,609 ordinary for the year ending March 31, 1958. Last year's tax free interim of 1¾ per cent. was on £9,046,352, and the 3½ per cent. tax free final was on the present capital. The 4 per cent. interim accords with the statement made at the meeting last September that in future the dividend would be in terms of rate per cent., instead of an amount per unit, and as a gross instead of a net dividend. Further, that the interim dividend increase should not be taken as an indication that the total for the current year would be greater.

MILLSPAUGH, LIMITED, papermaking machinery manufacturers, and founders—A 19 per cent. increase in sales in the year to September 28 is attributed by the chairman, Lord Dudley Gordon, mainly to a very successful year by the Canadian subsidiaries. So far as the current year is concerned, it cannot be expected that there will be any noticeable change. Competition is getting more severe and it is evident that in Canada a period of readjustment is at present taking place which is bound to cause some slackening in demand. One phase of this readjustment, he adds, will certainly be an effort to implement the declared intention to increase purchases from Great Britain. Profits before tax were £536,156 (£411,662), and the dividend is unchanged at 15 per cent. The company is a subsidiary of Hadfields, Limited.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

COLWYN BAY, February 28—Supply of all materials and construction of approx. 235 lin. yard of 6-in. dia. cast-iron outfall sewer. Documents from Mr. H. Wilman, Borough Engineer and Surveyor, Whalley Range, Lansdowne Road, Colwyn Bay.

COLNE VALLEY—Materials required by Urban District Council include cast-iron gullies, grates, and manhole covers (Ref. No. 17). Documents from the Surveyor of the Council, Municipal Offices, Carr Lane, Slaithwaite.

DEWSBURY, March 6—Requirements of County Borough Water Department include cast-iron pipes and specials. Documents from the Water Engineer, 10, Church Street, Dewsbury.

ROWLEY REGIS, February 21—Supply of following for Borough Council: cast ironwork, etc. Documents from John Hilton, Town Clerk, Municipal Buildings, Old Hill, Staffs.

BENFLEET, February 28—Requirements of Urban District Council include cast-iron goods. Documents from the Engineer and Surveyor, Council Offices, Thundersley, Essex.

COSELEY, February 28—Materials required for Urban District Council include cast-iron and rainwater goods. Documents from Joseph C. Roper, Clerk of the Council, Council House, Coseley.

BUCKS, March 1—Supply of iron castings (gully grates, weirs and manhole covers). Documents from County Surveyor, County Offices, Aylesbury.

NEWTON-LE-WILLOWS, February 28—Requirements of Urban District Council include iron castings (manhole covers and frames, street gully covers and frames). Documents from the Engineer and Surveyor, Market Chambers, Newton-le-Willows.

GLOUCESTER, February 24—Spun-iron pipe sewers, and provision and laying of spun-iron pumping mains, required for Frampton-on-Severn and Fretherne-with-Saul sewerage and sewage disposal scheme. Documents from W. Herbert Bateman & Partners, Chesterfield House, Batheaston, Bath. Deposit £3 3s.

U.S.A.—Mr. J. William Julian of the Atlas Manufacturing Company Inc., 433 North Capitol Avenue, Indianapolis 4, Indiana, wishes to contact United Kingdom manufacturers of replacement engine and chassis parts for British and Continental automobiles. The Atlas Manufacturing Company have no manufacturing facilities themselves, but have the production performed by specialist companies on a contract basis. They produce replacement parts for American automobiles and they sell to automobile parts dealers throughout the United States and in many foreign markets. Mr. Julian is not interested in handling purely accessory items, nor in replacement parts for obsolete models of cars. His interest is solely in engine and chassis parts for recent models of the British and Continental makes which have achieved popularity in the US. Manufacturers interested in this enquiry should write by air mail direct to Mr. Julian. It is important that quotations should show both F.O.B. and C.I.F. prices in US currency. It would be appreciated if responding firms would copy their initial correspondence to the British Consulate-General, 720 N. Michigan Avenue, Chicago 11, Illinois, so that the enquiry may be pursued. (ESB/2894/58.)

Latest Foundry Statistics

Steel Castings. Figures issued by the British Iron and Steel Federation and the Iron and Steel Board on December 7, 1957, showed that 20,900 people were at work in the steel foundries. This was 190 more than on November 9 and 300 more than a year ago. The average weekly output of steel castings during December was very low at 4,300 tons, probably owing to the Christmas holidays. The figures for steel casting production are still marked with "e"; that is, they are estimated values.

Light-alloy Castings: As reported by the Ministry of Supply, output of the three types of aluminium castings during November, 1957, was as sand cast, 1,891; as gravity-die, 4,167, and as pressure-die 1,425 tons. The production of magnesium castings was 218 tons.

New Catalogues

Multi-buckets System. Aero Maintenance Engineers, Limited, 110a, Clapham Park Road, London, S.W.4, are the British agents for a French design—"Multi-bennes"—of a system for handling, which so far as the reviewer knows is unique. To any make of lorry, a hydraulically-operated handling system is installed, and with this is associated a series of containers. Thus buckets, bundles or bins can be picked up, hoisted, and drawn on to the lorry. On reaching the destination, the lorry can, by reversing the operations, place the container and contents in store or empty the latter by dumping. The whole of these operations are controlled from the driver's cab. The firm have issued a 16-page illustrated brochure which clearly shows the potentialities of the system. It is reported to be well known in France, and exports have been made all over the world.

High-speed Alloys. The London and Scandinavian Metallurgical Company, Limited, 39, Wimbledon Hill Road, London, S.W.19, have issued—what is rare today—a well-bound catalogue. It describes a service which provides tool-steel makers with three base alloys in the form of 1-cwt. chequer plates or granules suitable for remelting by founders—much on the same lines that the bronze and aluminium smelters supply the foundry industry with ready-to-melt ingots. In this way, high-speed steel components may be guaranteed to conform to specification. The three materials described are ordinary tungsten, cobalt/tungsten and molybdenum/tungsten alloys and for each the full composition is quoted. The provision of such alloys is unquestionably a useful service to industry.

Precision Castings. Hadfields, Limited, East Hecla Works, Sheffield, in leaflet No. 530, which is captioned "Cut Your Machining Costs by using Precision Castings," have illustrated half-a-dozen types of components. These are unquestionably difficult castings to make, and a diverse range of alloys have been used in their production, by either the lost-wax or shell-moulding processes. As this pamphlet has placed the products from shell moulds in the category of precision castings, it reinforces the desirability of calling the product from the various lost-wax processes "precision-investment castings" when it is necessary to differentiate.

Electric Precipitators. In Publication No. 69, W. C. Holmes & Company, Limited, P.O. Box B.7, Turnbridge, Huddersfield, use illustrations of a large number of installations they have made to demonstrate the wide range and substantial nature of their contributions to the removal of dust and fume from industrial gas effluents of many types, from cement kilns to acid manufacture, boiler plants to blast-furnaces. The principles underlying the process of electrostatic separation are clearly explained and the practical aspects and electrical equipment associated with this method of gas cleaning are well dscribed.

Strainer Cores. Allan Levin, Limited, 4, Drapers Gardens, Throgmorton Avenue, London, E.C.2, who are the selling agents in this country for A. B. Iföverken Bromölla, Sweden, have published a four-page leaflet covering 10 sizes of ceramic strainer cores. Each bears a much longer number than would seem to be necessary—running from 62811 to 62820. Eight are of circular section and two, the largest, rectangular. These are all dimensioned on the inside of the leaflet, whilst on the back a chart correlates each number with the equivalent gate area in square inches, metal delivery in cubic inches, and lb. per sec. and the head pressure in inches. They carry the trade name of Cordierite.

Alloy Briquettes. When one starts to read Publication 165, issued by the Alloys Division of Union Carbide, Limited, of Wincobank, Sheffield, one naturally turns over the first leaf—a full-page advertisement—only to find that the brochure is a collection of such. This is an innovation which the reviewer would not care to see repeated, as he believes that the "guts" of a catalogue should marry up with editorial matter rather than just advertising. However, as a "just for once" idea, it has its merits as being so entirely different from the average production.

Pyrometers. Publication No. 170/S1, issued by Electroflo Meters Company, Limited, Abbey Road, Park Royal, London, N.W.10, describes and illustrates a wide range of temperature indicators and recorders, some of which are designed to give two- or three-point readings, with a scale ranging from 0 to 1,800 deg. C. or 0 to 150 deg. C.

Publications Received

Buyers' Guide to Paper and Board, by Dr. Julius Grant. Published by the Purchasing Officers' Association, 146a, Queen Victoria Street, London, E.C.4; price 3s. 6d.

During the period of paper restriction, it was stated that the largest user of paper and the like was industry—a matter easily understood from but a cursory examination of any rubbish pile. This pamphlet explains the manufacture and outlines the specifications germane to the different types of paper. The pamphlet is divided into four sections: manufacturing (as noted above); uses; properties and categories of writing paper; printing papers; and wrappings—boards and coated papers. Many useful tips are given for the assessing of the worth of these products. The bill to be met yearly by industrial concerns for paper and the like is often very heavy, and this book indicates means for ensuring that one gets value for money.

Electrical Year Book, 1958 edition. Published by Emmott & Company, Limited, 31, King Street West, Manchester 3; price 3s. 6d. (by post 4s. 2d.).

In the 1958 edition of this "Year Book," which comprises a collection of electrical engineering notes, rules and tables, the stress on developments in the field of electronics has resulted in the section devoted to electronic devices being considerably extended. It now includes fuller information on amplifiers, time-delay circuits, gas-filled valves, motor control and oscillators.

Mechanical World Year Book, 1958 edition. Published by Emmott & Company, Limited, 31, King Street West, Manchester 3; price 4s. 6d., by post 5s. 2d.

The 1958 edition of the "Mechanical World Year Book" includes an entirely new section devoted to the die-casting process. This has been added to usual contents in view of the important position which the process now occupies in the production of quantities of components. New and revised material has also been introduced to cover more fully the subject of the design of gas turbines, and the information on steam turbines has been brought up to date.

Imports and Exports of Iron and Steel in December

The following tables, based on Board of Trade returns, gives figures of imports and exports of iron and steel in December. Totals for last year and 1956 are also included.

Total Exports of Iron and Steel

Destination.	Month ended Dec. 31.	Year ended December 31.	
	1957.	1956.	1957.
	Tons.	Tons.	Tons.
Channel Islands	353	5,347	3,711
Cyprus	570	8,868	12,155
Sierra Leone	271	8,765	12,925
Ghana	2,014	23,868	22,608
Nigeria	4,640	53,293	55,929
Union of South Africa	16,535	68,032	117,489
Rhodesia and Nyasaland	8,612	76,923	69,426
Tanganyika	2,267	23,076	22,663
Kenya	8,706	42,581	55,097
Uganda	418	4,389	4,109
Mauritius	399	3,620	3,522
Aden	144	5,152	4,630
Bahrein, Qatar, and Trucial States	1,776	11,978	17,121
Kuwait	3,503	11,352	37,197
India	8,961	290,965	214,430
Pakistan	10,237	60,853	72,237
Singapore	4,031	36,355	40,514
Malaya	2,101	34,422	31,724
Ceylon	2,728	27,846	27,753
British North Borneo	304	6,893	4,008
Hongkong	4,873	76,660	78,451
Australia	14,383	207,522	184,642
New Zealand	17,610	181,207	215,812
Canada	17,081	292,546	276,850
Jamaica	3,195	22,395	27,148
Trinidad	5,500	40,941	52,801
British Guiana	910	5,452	7,788
Other Commonwealth countries	1,478	29,350	27,973
Eire	6,563	63,082	48,114
Finland	6,146	60,774	83,989
Sweden	9,211	106,410	108,409
Norway	7,789	89,137	103,858
Denmark	8,597	80,919	104,279
Western Germany	552	8,595	9,628
Netherlands	6,458	92,198	95,570
Belgium	2,417	32,323	43,896
France	162	12,111	14,939
Switzerland	1,038	14,172	16,243
Portugal	1,367	10,928	16,936
Spain	2,273	27,511	38,448
Italy	2,621	18,427	53,359
Austria	2,204	5,144	7,142
Yugoslavia	1,008	8,819	11,161
Greece	1,773	5,860	12,547
Turkey	1,100	3,865	9,208
Netherlands Antilles	296	7,231	3,164
Portuguese East Africa	389	2,899	4,225
Egypt	3,761	35,416	13,080
Sudan	3,880	12,460	22,202
Lebanon	2,501	5,348	18,669
Israel	258	7,487	4,448
Saudi Arabia	502	16,275	4,636
Iraq	2,953	28,923	38,997
Iran	4,520	59,661	59,769
Burma	805	9,764	23,959
Thailand	432	8,318	7,608
Indonesia	673	9,059	6,941
Philippine Republic	408	7,724	7,470
USA	3,348	69,499	48,617
Cuba	357	9,010	8,325
Colombia	1,557	4,692	10,217
Venezuela	7,036	66,501	114,063
Ecuador	297	3,970	3,022
Peru	1,270	16,416	13,586
Uruguay	161	7,803	6,795
Argentina	14,066	52,757	118,402
Other foreign countries	10,343	80,992	143,673
TOTAL	264,692	2,823,131	3,160,307

THE LOWEST ESTIMATE for a contract to design and manufacture three power transformers for an American sub-station in the St. Lawrence power project, was given by the English Electric Company, Limited, according to the New York State power authority. The company's bid was $708,000.

Total Imports of Iron and Steel

From	Month ended Dec. 31.	Year ended December 31.	
	1957.	1956.	1957.
	Tons.	Tons.	Tons.
Rhodesia and Nyasaland	170	3,679	5,742
Canada	5,260	59,752	45,982
Other Commonwealth countries and Eire	1,980	9,105	23,369
Soviet Union	7,887	302,879	236,488
Sweden	3,568	47,517	34,283
Norway	11,647	110,107	119,097
Western Germany	9,565	214,913	107,274
Netherlands	7,440	96,079	77,159
Belgium	6,331	352,470	142,229
Luxembourg	652	56,754	23,990
France	5,868	214,330	69,573
Italy	18	13,523	4,058
Austria	150	161,897	59,985
Japan	643	18,993	14,668
USA	21,260	394,200	293,327
Other foreign countries	317	66,007	27,340
TOTAL	82,756	2,122,205	1,284,564
Iron and steel scrap and waste, fit only for the recovery of metal	17,968	981,447	666,445

Exports of Iron and Steel by Products

Product.	Month ended Dec. 31.	Year ended December 31.	
	1957.	1956.	1957.
	Tons.	Tons.	Tons.
Pig-iron	9,026	143,535	129,134
Ferro-columbium (niobium)	1	163	82
Ferro-tungsten	21	1,161	556
Other ferro-alloys	343	4,409	3,283
Ingots, blooms, billets, slabs, sheets, and tinplate bars	3,452	1,951	4,449
Iron bars, rods, angles, shapes, and sections	110	2,096	1,825
Steel bars, rods, angles, sections, and shapes	37,412	466,113	502,418
Iron plates and sheets	2	506	115
Universal plates	63	3,181	6,300
Steel plates, ⅛ in. and under ¼ in.	720	10,572	10,969
Do., ¼ in. and over	17,158	220,226	189,254
Blacksheets and blackplate	31,088	233,771	352,732
Hoop and strip	8,149	85,228	87,713
Tinplate	33,173	299,944	408,514
Decorated tinplate	317	5,555	5,033
Galvanized sheets	6,522	157,573	176,705
Other (incl. tinned sheets, terneplate, and ternesheets)	1,473	13,774	19,135
Railway and tramway construction material	32,096	252,783	269,305
Wire rods	3,522	42,164	54,936
Wire	7,914	95,896	107,964
Tubes, pipes, and fittings	70,953	773,008	816,698
Iron castings	101	2,542	1,733
Steel castings	250	1,832	2,983
Forgings	826	5,148	8,471
TOTAL	264,692	2,823,131	3,160,307

A RECORD VOLUME of gear-cutting plant—nearly 400 tons—was despatched by the machine-tool division of David Brown Industries, Limited, during the six weeks to the end of January. Large shipments were exported to countries including Italy, Sweden, and Japan. The latest order from France is for two large machines capable of producing turbine gears and pinions up to 220-in. and 60-in. diameter, respectively.

News in Brief

NOBEL & LUND, LIMITED, machine-tool manufacturers, Felling-on-Tyne, Co. Durham, is proceeding with plans for the erection of a 200 by 50-ft. extension to the foundry.

COSTING ABOUT £20,000, a new laboratory and surgery block is being built by Peglers, Limited, brassfounders, at their Belmont Works, Balby, Yorks., and should be completed during April.

Col. C. A. B. LINDOP, O.B.E., D.I., J.P., chairman of H. W. Lindop & Sons, Limited, Pleck Road, Walsall, recently presented long-service awards to eight employees who had each completed 25 years continuous service with the company.

TWO BOILER UNITS for the new Komati power station in eastern Transvaal are to be supplied and erected by Mitchell Engineering, Limited, Peterborough, under a contract worth nearly £2,500,000 which it has received from the Electricity Supply Commission of South Africa.

SAMUEL BIRKETT & SONS (CLECKHEATON), LIMITED, non-ferrous founders and engineers, announce that they have changed their address to Queen Street Works, Heckmondwike, Yorkshire. The change of address involves the re-housing of the offices, machine shops and foundry in premises of increased floor area than previously.

Mr. NORMAN A. HARPER took as his subject "How to become a Millionaire" when he addressed those attending the monthly luncheon of the Non-Ferrous Club at the Queen's Hotel, Birmingham, on February 5. A collection taken on behalf of the Royal Metal Trades Pension and Benevolent Association produced £15 15s. 6d.

G. & J. WEIR, LIMITED, Glasgow, has received an order for 20 feed pumps for the Hunterston nuclear power station now being constructed for the South of Scotland Electricity Board. The order was placed by Simon-Carves, Limited, which is associated with the General Electric Company, Limited, in the construction of the station.

ON JANUARY 15, the fourth and last blast furnace of the Ijmuiden Hoogovens ironworks in the Netherlands was put into operation, whereby the first phase of the extensions planned for 1958 was completed. The furnace has a capacity of 1,400 tons of pig-iron a day, bringing the total production capacity of the plant to about 1,000,000 tons a year.

THE seventh International Mechanical Engineering Congress is to be held in The Hague, Holland from June 2 to June 6. It is being organized by the Vereniging van Metall-Industrieën. There are to be technical sessions and a round of sightseeing trips. Full details are available from the Secretariat CIM 7, Burgemeester de Monchyplein 14, The Hague.

ACCORDING to the E.S.C. (English Steel Corporation Limited), *Information Bulletin*, a new course of instruction in foundry practice, organized by the Foundry Trades Technical Society with the co-operation of Sheffield University, has been launched. Sixty apprentices have been enrolled. Every other week the foundry will be visited and the following week there is to be a discussion on what was seen. The course costs 10s.

WORK is being started at Bromford, Birmingham, by the Esso Petroleum Company, Limited, on a new £1,000,000 oil storage depot. The new depot, which will serve the Midlands area, will have capacity for the storage of 8,500,000 gallons of all types of oil and will be the largest of the company's inland depots in the United Kingdom. It is hoped to have storage facilities for 2,500,000 gallons of fuel oil completed by the end of the year.

A FILM showing how a large engineering firm, employing about 4,000 people, embarked on a complete reorganization scheme to secure higher efficiency in cost, production, development and quality control, has been made at the Edmonton factories of British Oxygen Engineering, Limited, and British Oxygen Gases, Limited (equipment division). It is entitled "The Whole Works" and further details as to its availability for showing are to be had by writing to the British Oxygen Company, Limited, Angel Road, Edmonton, N.18.

Mr. VINCENT JOBSON, chairman and managing director of Qualcast, Limited, ironfounders, Derby, says in a message to shareholders and employees, "There is a fair amount of talk about a coming depression. Frankly, I cannot see any reason why there should be one but the gravest danger is that we might talk ourselves into it." In referring to productivity at Qualcast he said the company seemed to be out of the recession in the motor trade, and all its foundries were running at capacity and turning out record tonnages.

THE EXTENSION to the works of the British Tabulating Machine Company, Limited, at Castlereagh, near Belfast, which is nearing completion is to be doubled in size. The extension will now total over 200,000 sq. ft. and will nearly double the production area of the works on the Castlereagh Government factory estate which the company has rented from the Ministry since 1949. The company at present employ over 1,500 workers and when the two extensions are in production some 2,500 will be employed—the majority will be men.

SHEFFIELD took a great part in the revolutionary discoveries of steam power and the internal combustion engine, said the Lord Mayor of Sheffield, Alderman A. Ballard, on February 3, when replying to the toast of "The City and Trade of Sheffield" at the Jubilee dinner of the Association of Certified and Corporate Accountants Sheffield and District Society. He went on to say, "We also made the steel for the jet engine and for the peaceful use of nuclear energy. And I have no doubt whatever that Sheffield will play its part in this new revolution of Zeta."

THE NINTH ANNUAL REUNION DINNER of former apprentices of the United Steel Companies, Limited, was held in Sheffield on February 7. Mr. D. R. O. Thomas, chief education officer of the company, showed that a greater number from the company was going to universities. In 1949 there were 22, in 1957 there were 55, and this year there are 77. Of these 77, 17 are studying engineering, 36 metallurgy, 16 chemistry or physics or both, two fuel technology, and four the arts, of which 20 were at Sheffield University, 15 at Durham, 11 at Nottingham, and eight at Swansea.

OVER 300 WORKERS at the Thorncliffe Iron Works of Newton Chambers and Company, Limited, Chapeltown, attended a meeting called by the Joint Shop Stewards' Committee on February 9 to consider action after 32 workers in the light foundry division had been given a warning of possible redundancies the previous Tuesday. The men had been told it was probable they would get a week's notice at the end of three weeks. The firm is making efforts to find work for the men in other departments. The workers claimed that the notices were issued without recourse to the normal negotiating machinery. Men in the engineering divi-

sion called for a strike but the meeting on February 9 decided to withhold action provided the notices were withdrawn and the long-standing negotiating machinery was used by meeting the committee.

MORE THAN 174,000 GROSS TONS of shipping was built by Harland & Wolff, Limited, during 1957, said Mr. J. S. Baillie, a director, after the launching of the 14,500-ton ore-carrying motorship Iron Age, from the company's Govan shipyard, Glasgow, recently. They were building a great variety of tonnage and in the shipyard that day they had only one tanker in hand, which indicated the predominantly large space taken by dry cargo ships in their programme. The Iron Age is one of a series of 72 ore carriers for companies in which B.I.S.C. (Ore), Limited, is a partner of charterer. It is owned by the Vallum Shipping Company, Limited.

SPEAKING at the first general meeting of the Coventry Productivity Committee on February 6, Sir Charles Norris, director of the British Productivity Council, said the motor industry had pioneered the modern concept of increased productivity and the reward was unprecedented prosperity and expansion. The motor industry, knew better than most industries about the fierceness of modern competition and the urgency to keep productivity steadily rising, Sir Charles said. The industry had the right attitude towards the expanding use of new methods and new production techniques he went on. One of the most urgent aims, however, should be to improve communications between education and industry where a serious gap had to be bridged.

Mr. R. LANGTON HIGHTON, until recently managing director of the Workington branch of the United Steel Companies, Limited, was the guest speaker at the 91st annual dinner of the Staffordshire Iron and Steel Institute in Wolverhampton on February 7. Proposing a toast to the Institute, Mr. Highton expressed the opinion that the Iron and Steel Board exercised sufficient control to ensure the industry working in the national interest. Referring to the possible renationalization of the industry he recalled that he had been a member of the former nationalized Iron and Steel Corporation, and went on to say "Whatever you may do in a nationalized industry you cannot help but have some political interference even if the people who set it up do not mean to interfere. To-day we have in the industry, through the Iron and Steel Board, that control which, in the long run, ensures that however much an individual may seek to do things his own way for his own benefit, he must, indeed he does, take as his standard the well-being of the country."

SIR FREDERIC HOOPER was the guest speaker at the annual luncheon in Birmingham, on February 5, of the Midland Region of the British Institute of Management. Referring to the 25,000 regular officers who would be leaving the Services in the next five years he said they would provide one of the best pools of potential management. Qualities to be looked for when employing these men were, first, mental and physical qualities. Devotion of one's entire time to business, Sir Frederic said, was the cause of many modern ailments. Outside mental interests would bring more flexibility of mind. Judgment was second. The higher one climbed the management ladder, the more experience could become a handicap rather than an asset because of the tendency to view the present and future in terms of past business experience. Third, the potential executive should have skill in communication between people as between various departments, and the fourth attribute was vitality; the outlook that although yesterday was interesting, to-day was more exciting and to-morrow was more thrilling yet.

Forthcoming Events

FEBRUARY 17

Society of Chemical Industry

Pesticides and Corrosion groups: Corrosion in Spraying and Dusting Machinery," by F. J. Coursbee, B.Sc., 6 p.m., at the Society's rooms, 14, Belgrave Square, London, S.W.1.

Institute of Vitreous Enamellers

Midland section:—"Design," by W. A. Ross, 7.30 p.m., at the Birmingham Exchange and Engineering Centre, Stephenson Place.

FEBRUARY 18

North-East Metallurgical Society

"Modern Developments in Iron and Steel Works Refractories," by H. M. Richardson, B.Sc., 7.15 p.m., at the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough.

Institute of British Foundrymen

East Anglian section:—"Mechanization of a Small Jobbing Foundry," by R. Blandy, 7.30 p.m., at the Lecture Hall, Public Library, Ipswich.

Incorporated Plant Engineers

Birmingham branch:—"Slinging and Handling," by A. Thwaite, 7.30 p.m., at the Hotel Leofric, Coventry.

FEBRUARY 19

Incorporated Plant Engineers

Kent branch:—"Applications of Photography in Science and Engineering," by J. F. Padday, 7 p.m., at the Kings Head Hotel, High Street, Rochester.

Institution of Production Engineers

Wolverhampton graduate section:—"Ferrous Die-casting," by H. E. Redshaw, 7.30 p.m., at the Wolverhampton and Staffs College of Technology, Wulfruna Street.

Institute of Vitreous Enamellers

Southern section: "New Approach to the Problems of Blistering of Enamels": Dr. B. K. Nicklewski will speak on "Sheet Iron" and Mr. C. P. Stokes on "Cast Iron"; 7.15 p.m., at the Howard Hotel, Norfolk Street, London, W.C.2.

FEBRUARY 21

Institute of British Foundrymen

West Wales section:—"Work-study in the Foundry," by W. B. Trenholme, 7 p.m., at Glanmor Foundry Canteen, Llanelly.

Stoke-on-Trent section:—Dinner/dance at the Grand Hotel, Hanley.

FEBRUARY 22

Institute of British Foundrymen

Northampton and district section:—Brains Trust, 6 p.m., at the Coffee Room, Plough Hotel, Northampton.

Wales and Monmouth branch:—Works visit to Saunders Valve Company, Limited, Cwmbran, 2.30 p.m., followed at 6 p.m. by a lecture on "Work-study in the Foundry," by W. B. Trenholme.

STURTEVANT ENGINEERING COMPANY, LIMITED—Mr. W. E. N. Gwilt, managing director, retires at the end of April. As from that date, Mr. H. W. Wagner has been appointed deputy chairman and joint managing director, and Mr. A. B. Davies joint managing director.

THIS EVENING'S MEETING of the Beds and Herts section of the Institute of British Foundrymen is being held at the works of W. H. Allen, Sons & Company, Limited, Bedford, when Mr. T. H. Weaver, of W. & T. Avery, Limited, will talk on "Shell Moulding Developments." It is expected that the lecture will deal with well-tried methods of shell moulding and shell core-making and in addition with some newer processes and equipment.

Personal

Mr. J. DUNKERLEY has been elected a director of Henry Broadbent, Limited, machine tool manufacturers, Hollins Tool Works, Sowerby Bridge, near Halifax.

Mr. L. A. WITHAM, of L. A. Witham & Company, Glasgow (foundry suppliers), has been elected vice-president of the Glasgow branch of the Scottish Commercial Travellers Association.

Mr. L. H. COOPER, chairman of the Mond Nickel Company, Limited, and vice-chairman of the International Nickel Company of Canada, Limited, has been elected a director of that company.

Mr. H. T. MARKS has been appointed president of the Ferro Corporation, of Cleveland (Ohio), US, parent company of Ferro Enamels, Limited, Wombourn, Wolverhampton, following the death of Mr. D. Clawson.

Smith & Wellstood, Limited, Bonnybridge, announce that Mr. FYFE SMITH left early this month for South Africa where he is to stay for two years. He is to be vice-chairman of Smith & Wellstood (Pty), Limited, at Springs, Transvaal.

British Road Services announce the appointment of Mr. J. KIRKLAND, Glasgow branch manager, as district manager, southern Scotland district. He succeeds Mr. J. P. (IAN) YOUNG, who has been appointed divisional manager, Scottish division.

Mr. ROBERT K. JACKSON, holder of the diploma of the National Foundry College and secretary of the North East Lancashire section of the Institute of British Foundrymen, has been appointed foundry manager of Cooper Brothers, Limited, Burnley, Lancs.

Mr. W. RALPH BLAKEBOROUGH has been appointed a director of Glenfield & Kennedy Holdings, Limited. Mr. FREDERICK A. KLOUMAN has relinquished his seat on the board and has retired from his executive appointment with J. Blakeborough & Sons, Limited, a subsidiary company.

Dr. H. D. RITCHKEN, a director of the Premier Metal Company of South Africa, Limited, has been elected chairman in succession to Mr. J. Haker, who has resigned from the board. Mr. W. W. BETT has been appointed secretary in place of Mr. E. W. Bayliss, who has resigned.

Lord CHANDOS has been appointed a trustee of the National Gallery in succession to the Duke of Wellington, whose term of office has expired. Lord Chandos, who is 65, is chairman of Associated Electrical Industries, Limited, and a director of Imperial Chemical Industries, Limited.

Mr. C. H. DAVY, resident director of Babcock & Wilcox, Limited, Renfrew, has been appointed a director of the Glasgow Chamber of Commerce. Mr. W. L. FRENCH, chairman of Fleming & Ferguson, Limited, shipbuilders and Engineers, Paisley, has been elected president of the Chamber.

Mr. HAROLD HEATH, chairman and managing director of Coventry Radiator and Presswork Company, Limited, and a director of several other companies, has been re-elected president of the Coventry and District Engineering Employers' Association. It will be the third year he has held this office.

Consequent upon the death of Mr. A. C. Wells the following appointments have been made to the board of directors of Lion Foundry Company, Limited, Kirkintilloch, near Glasgow. As chairman Mr. D. DICKSON and as joint managing directors Mr. D. C. MILLER and Mr. A. R. WELLS. These appointments became effective as from January 31.

AT THE STATION HOTEL, DUDLEY, four employees of Northern Aluminium Company, Limited, Middlemore Road, Handsworth, were recently entertained to a dinner celebrating their completion of 25 years' service with the company. They were: Mr. C. T. GRAY, milling-machine operator; Mr. G. LANE, of the pattern-shop; Mr. T. PRICE, coreshop foreman; and Mr. T. WATSON, heat-treatment chargehand.

Commandatore MARIO OLIVO has been elected an honorary member of the *Association Technique de Fonderie*. It was but a few weeks ago since he received a similar honour from the German foundry technical association. A third honour accorded to Mr. Olivo was the distinction of being made honorary president of the Foundry Trades' Equipment & Supplies Association of Italy (Amafond, of Milan).

Mr. T. H. R. PERKINS, a director of F. Perkins, Limited, the Peterborough diesel engine manufacturers, and general manager of its sales division, is at present touring principal Indian cities contacting mutual customers of his company and of Simpson & Company, of Madras, which is manufacturing Perkins engines under licence. The primary reason for his visit is to have business discussions with the latter company.

Mr. F. J. CLARK, managing director of the British Oxygen Company, Limited, chairman of British Oxygen Engineering, Limited, and Sparklets, Limited, and a director of British Oxygen Aero Equipment, Limited, and British Oxygen Linde, Limited, has relinquished his appointments with the group. It is understood that his decision was by mutual consent following some reorganization of the management structure of the company.

Councillor SIDNEY HARRIS, who has been nominated as Mayor-elect of Rotherham, was national president of the British Iron, Steel and Kindred Trades Association in 1956. He is still a member of the national executive, and secretary of Temple No. 2 and No. 3 branches of the Association. He has been employed by Steel, Peech & Tozer, Limited, since 1922, and has been a member of the central negotiating committee for the heavy-steel industry for many years.

After 47 years in the foundry of the engineering works of the Bryan Donkin Company, Limited, Chesterfield, Mrs. NELLIE BOOKER has retired. She began work in the coreshop in January, 1911, and for two years during the 1914-18 war she was in charge of the women moulders. From 1927 until her retirement she was forewoman in charge of some 30 girls in the coreshop. To mark her retirement, Mrs. Booker received farewell gifts from the staff and colleagues.

Obituary

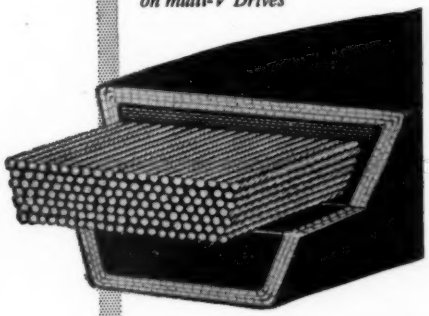
Mr. H. ENGLAND who had been a foreman at Pickersgill & Frost's Star Foundry, Langley Mill, Notts, for 22 years, died on January 26 at the age of 50.

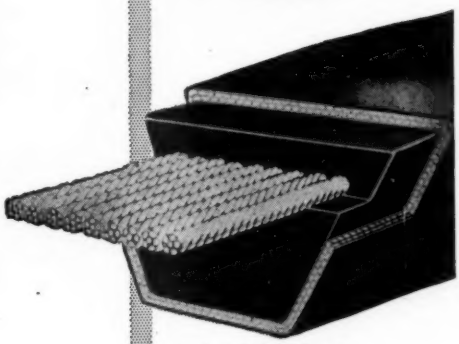
Mr. G. L. DAWSON, wharf superintendent for Cochrane's (Middlesbrough) Foundry, Limited, until his retirement last March, died on February 3 at the age of 66.

Mr. ROBERT K. FLEMING, honorary president of Igranic Electric Company, Limited, motor control gear manufacturers, died on February 3 at the age of 66. He joined the company in 1924, and was appointed managing director in 1941, a position he held until 1953, when, through ill health, he was compelled to give up active management, but became chairman of the board.

V-BELTS THAT ARE BUILT TO LAST!

on multi-V Drives





and on F.H.P. Drives

YOU BUY ENDURANCE when you buy Goodyear V-Belts, made in types and sizes to suit every job from the largest multi-V installations to small F.H.P. drives. Longer belt life, more efficient transmission, less risk of costly shutdowns — these are the positive benefits of making good use of the Goodyear 'job-designed' range of belts which are backed by more than fifty years' experience in rubber engineering.

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THE GOODYEAR TYRE & RUBBER COMPANY (GREAT BRITAIN) LIMITED · WOLVERHAMPTON

Raw Material Markets

Iron and Steel

The amount of business available at the different types of foundries varies considerably and some are much better off for work than others. The engineering and speciality foundries are receiving good demands from many users of high-duty castings, the motor vehicle trades being mainly responsible for sufficient orders to ensure good outputs of castings. From some users, including the machine-tool makers, demands for castings are not at such a high level as there has been some falling off in the demand for machine tools. The seasonal demand from agricultural implement makers should step up their requirements of castings, and, generally, there is every prospect of a continuity of business at present levels for some time ahead.

Unfortunately there are not the same prospects at present for many other units, including the light and textile foundries, while many of the jobbing foundries would like to be assured of more business. Most of these foundries have been striving for a long time to improve their position, but orders are scarce and competition keen. In many cases the mechanization of the foundries calls for a much larger volume of work to keep them fully employed, than has been obtainable for some time, and the immediate future holds out little hope of an appreciable improvement. Orders now being placed are readily completed.

Plentiful supplies of pig-iron in most grades are available, and a bigger demand would obviate the necessity of producers increasing their stocks. This applies particularly to the high-phosphorus pig-irons, outputs of which are much in excess of demands from home users. Supplies, however, are being shipped to overseas buyers for whom it is understood appreciable tonnages have been booked recently. Hematite also is in good supply and refined iron makers could undertake much more business. The low-phosphorus pig-iron available is in good demand and makers are able to dispose of their outputs without difficulty. Many users take up any additional supplies of this grade when available in place of the more expensive hematite and refined irons.

Foundry coke deliveries are satisfactory, and sufficient supplies are coming to hand for both consumption and stock requirements. Most of the foundries are well provided with scrap and most grades are available to satisfy demands.

The re-rollers have no difficulty in obtaining their requirements of steel semis in the normal grades and sizes, although the carbons and alloy steels are not so easy. Home steelworks could undertake much more business for billets than is at present forthcoming, but the scarcity of orders from home users has enabled them to accept business from overseas buyers.

The demand for small bars and light sections continues moderate, keeping many mills on a shortened working week, and their consumption of billets, of which a large proportion is taken from stock, is much below normal. As these stocks are eliminated increased demands will be made, and during the last week or two larger tonnages have been called for. The reduction in imports will also result later on in bigger demands on home suppliers. The call for larger sections and bars is fairly good, and reinforcing rods continue in good demand.

Home steelworks are finding it difficult to dispose of their arisings of defectives and crops, due mainly to the plentiful supplies of prime material and also to the fact that the re-rollers consider the price insufficiently attractive.

Non-ferrous Metals

The copper price is vulnerable on both sides of the Atlantic. In fact, rumours at the end of last week that a ½ cent reduction in the US custom smelter price to 23½ cents a pound had been effected was sufficient for the LME price to recede to lower levels. Although the rumour was denied, it is reported that one leading smelter was prepared to sell reasonable quantities at 23½ cents a pound. In any event, it seems that the US price structure must give way to further adjustment.

The feature of the market is, perhaps, the good statistics released by the British Bureau of Non-Ferrous Metals, which show that consumption in the December quarter of 1957, at 164,300 tons, was above that of the second and third quarters. Stocks at the end of the year totalled 91,500 tons and, while these figures go against 61,700 tons in the comparable period a year ago, they represent a drop of nearly 10 per cent. from the September quarter figure.

Cutbacks in production continue and the latest producer to join the ranks is the Tsumeb Corporation, which is reducing its output by 20 per cent. During 1956, Tsumeb produced 26,000 short tons of copper metal. This move follows that of its associated company, the O'Kiep Copper Company, which announced a similar decision towards the end of last week. Elsewhere, it is of interest to note that the Japanese smelters have cut back their production by 25 per cent. to 8,000 tons a month. This, incidentally, is the second decline in Japanese output as a 15 per cent. cut was declared last October.

In tin, interest has focused around the re-establishment of a backwardation. While it is generally felt that this will only be temporary, the fact is that the buffer stock manager has had to support the cash price at £730 a ton. However, pressure on the cash quotation is now relatively light and it is to be remembered that stocks of tin fell last week by 126 tons. The real trouble about this market is the absence of American buying. Nevertheless, the New York price is holding up well at around 93 cents a pound.

According to the British Bureau of Non-Ferrous Metals statistics, UK consumption in 1957 amounted to 21,790 tons, against 22,873 tons in 1956. The whole of the drop could be accounted for by the decline in the December quarter, which, at 4,980 tons, was about 1,000 tons less than that of a year ago.

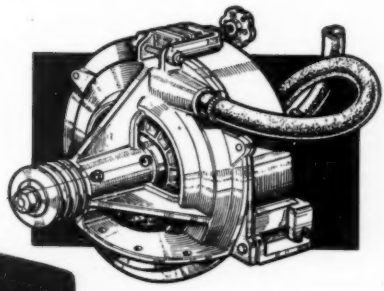
Russian tin is now deliverable against the standard contract on the London Metal Exchange. This applies only to a high-grade brand of tin which so far has only formed a small proportion of known Russian exports. Although this will provide a market outlet for the producer, no noticeable increase in supplies of this high-grade brand of tin from the USSR is expected.

Lead is weak in London and dull in the States, where the price is still holding at 13 cents a pound. The American price is still benefiting from the monthly intake to the Government stockpile, but it is believed that this will cease with the March tenders. By then, no doubt, recommendations will have been made by the US Tariff Commission. UK consumption of lead in 1957 totalled 349,100 tons, against 357,000 tons in 1956. Stocks at the end of 1957 totalled 51,300 tons, 11,900 tons more than a year ago.

Zinc continues firmish in London and dull in America where the price is still called 10 cents a pound. UK consumption of zinc in 1957 totalled 316,400 tons, only 2,100 tons less than that achieved in 1956. These figures are taken from the British Bureau of Non-Ferrous Metals Statistics, which also revealed that zinc stocks at the end of 1957 totalled 44,900 tons, or virtually the same as a year ago.

Shot Blast Equipment

This A-S-L Turbine is the most modern Shot Blasting Unit available. The bi-phase air injection system enables shot to be projected at greater speeds using lower power with fewer replacements. The economies effected in spare parts alone are very substantial.



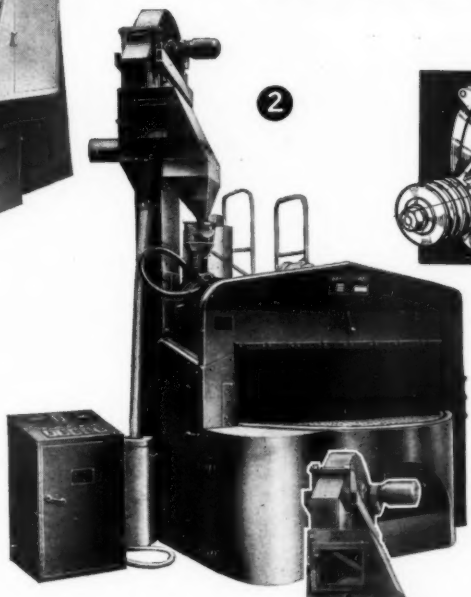
Baker Perkins High Speed Bi-Phase A-S-L Turbine, British Patent, No. 510681.

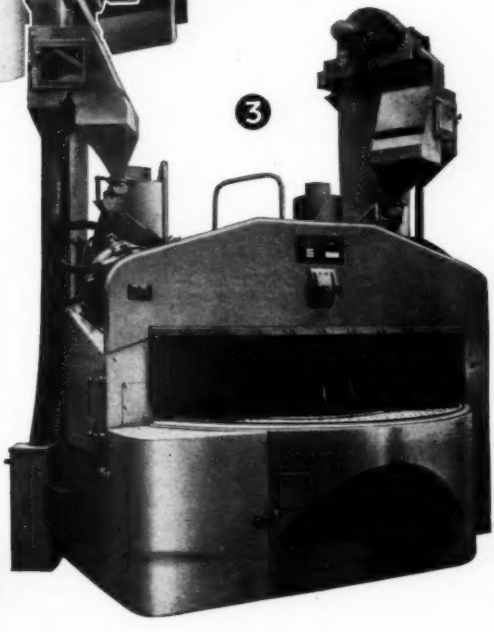
These machines do not require pits or special foundations.

1 **ROTARY BARREL**

2 **CADET**

3 **MEDIUM**





Our standard range of Rotating Barrel and Table Shot Blast Machines is capable of handling a wide range of Foundry products. Both types are semi-automatic, the rotating barrels being equipped with skip hoist loading gear and frontal discharge mechanism. These modern highly efficient machines are in use in Foundries all over the world, and are built to the high standards of design, materials and workmanship characteristic of all Baker Perkins' machines.

BAKER PERKINS LIMITED
ENGINEERS
WESTWOOD WORKS · PETERBOROUGH

Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

February 12, 1958

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £48 10s. 0d. to £50 15s. 0d., scale 17s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £68 10s. 0d. to £76 7s. 6d., scale 17s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 26s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 8s. 8d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 11s. 8d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £93 0s. 0d. to £96 10s. 0d., basis 60 per cent. Cr, scale 32s. 0d. per unit; over 6 per cent. C, £91 0s. 0d., basis 60 per cent. Cr, scale 31s. 0d. to 32s. 0d. per unit; 2 per cent. C,* 2s. 2d. per lb. Cr; 1 per cent. C,* 2s. 2½d. per lb. Cr; 0.15 per cent. C,* 2s. 3½d. per lb. Cr; 0.10 per cent. C,* 2s. 3¾d. per lb. Cr; 0.06 per cent. C,* 2s. 4d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 3d. to 7s. 10¼d. per lb.

Metallic Manganese.—90/92 per cent., carbon-free, £290 0s. 0d.; 96/98 per cent., £310 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 20s. 9d. to 21s. 3d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £87 19s. 3d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £33 1s. 6d.; tested, 0.08 to 0.33 per cent. C, £34 1s. 6d.; hard (0.41 to 0.60 per cent. C), £35 3s. 0d.; silico-manganese, £44 2s. 6d.; free-cutting, £37 5s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 7s. 0d.; silico-manganese, £44 10s. 0d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 16s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 18s. 6d.; acid, up to 0.25 per cent. C, £43 10s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 12s. 0d.; boiler plates (N.-E. Coast), £45 2s. 0d.; floor plates (N.-E. Coast), £44 1s. 0d.; angles (N.-E. Coast), £40 6s. 6d.; joists (N.-E. Coast), £40 2s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats, 5 in. wide and under, untested soft basic, 50 tons and over, £40 8s. 0d. (under 10 tons to 4 tons, £41 5s. 6d.; under 4 tons to 2 tons, £41 10s. 6d.); hoop and strip, coils, £40 10s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £45 16s. 0d.; black sheets (hand mill), 24g., £59 4s. 6d.; galvanized corrugated sheets, 24g., £67 6s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £69 9s. 6d.; nickel-chrome, £100 12s. 6d.; nickel-chrome-molybdenum, £112 16s. 6d.

NON-FERROUS METALS

Copper.—Cash, £160 10s. 0d. to £160 15s. 0d.; three months, £161 15s. 0d. to £162 0s. 0d.; settlement, £160 15s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 1s. 7⅞d. per lb. rods, 189s. 3d. per cwt. basis; 20 s.w.g., 219s. 6d. per cwt.

Tin.—Cash, £730 0s. 0d. to £730 10s. 0d.; three months, £727 0s. 0d. to £727 10s. 0d.; settlement, £730 10s. 0d.

Lead (Refined Pig).—First half February, £73 12s. 6d. to £73 15s. 0d.; first half May, £73 15s. 0d. to £73 17s. 6d.

Zinc.—First half February, £64 0s. 0d. to £64 10s. 0d.; first half May, £63 10s. 0d. to £63 15s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £97 15s. 0d.; rolled zinc (boiler plates), all English destinations, £95 10s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £95 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 4½d. per lb.; sheets to 10 w.g., 149s. 0d. per cwt.; wire, 2s. 2¼d.; rolled metal, 149s. 0d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £127; B6 (85/15), —; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £169; HTB2 (38 tons), —; HTB3 (48 tons), —.

Gunmetal.—BS1400, LG2 (85/5/5/5), £155; LG3 (86/7/5/2), £166; G1 (88/10/2/½), £219; (88/10/2/1), —.

Phosphor Bronze.—BS1400, PB1 (AID released), £235 per ton.

Phosphor Bronze Strip, etc.—Strip, 217s. 9d. per cwt.; wire, 3s. 5d. per lb.; rods, 2s. 8½d.; tubes, 2s. 8½d.; chill cast bars: solids 2s. 10½d.; cored 2s. 11½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 4½d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 9¼d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 8¼d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £74 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £197 0s. 0d.; aluminium bronze (BS1400), AB1, £195; AB2, £210.

* Average 68-70 per cent.